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IVADO'S FRAMEWORK FOR EQUITY, DIVERSITY AND INCLUSION (EDI)

IVADO

HEC Montréal
Polytechnique Montréal
Université de Montréal

IVADO'S VISION AND STATEMENT OF COMMITMENT TO DIVERSITY

Data science is changing our societies. While the mobilization and inclusion of all talents is required to support these major transformations, a number of key social groups—and women in particular—remain underrepresented in data science, from academia to the job market. This underrepresentation becomes increasingly significant further and further up the management hierarchy.

The obstacles faced by women, visible minorities, people with disabilities, Indigenous peoples, people from economically disadvantaged backgrounds and early-stage researchers constitute major barriers to the excellence and sustainable development of the data science that IVADO works to promote. Indeed, data science is a powerful driver for job creation and innovation in all sectors, and excluding these talents from our researchers and innovators represents an estimable loss.

The lack of diversity also has a direct impact on knowledge generation, research review and innovation. Recent studies have shown that some technologies rooted in data science research serve to reproduce biases and perpetuate discrimination based on identities including gender, ethnic origin and social background. These biases are anchored in a range of sources, and the lack of diversity in the field is a major hurdle in the determination and lasting resolution of these issues.

At IVADO, we are convinced that an inclusive academic culture sparks reflection and creativity and helps attract, motivate and retain diverse talents. For all these reasons, the values of equity, diversity and inclusion (EDI) are an integral part of our mission. By setting out guidelines to foster EDI in our ecosystem, we aim to strengthen our commitment to the inclusive development of data science.

As a leader in this evolving field, IVADO must ensure that its ecosystem benefits from its greatest talents and that the advancement of knowledge and opportunities in the sector equally benefit all members of society.

In response to these challenges, IVADO's framework for equity, diversity and inclusion involves a number of strategic objectives that are all closely linked.

PRIORITY 1
Increase the participation and voice of groups that are underrepresented in data science in order to broaden the talent pool and ideas that make up our ecosystem

PRIORITY 2
Understand and remove the structural and institutional barriers to the inclusion of these groups in their education and careers

PRIORITY 3
Enhance the quality, benefits and social relevance of data science research and training by accounting for diversity-related issues and biases in knowledge generation

By working together to create a more inclusive research culture, we aspire to increase the innovation potential in data science within our ecosystem to the benefit of us all.

Gilles Savard, Chief Executive Officer of IVADO, may 2019

The IVADO EDI reference framework complements the strategies and programs developed by Université de Montréal, Polytechnique Montréal and HEC Montréal. IVADO also supports and/or promotes the initiatives of the data science ecosystem, including those of its members and partners, the International Observatory on the Societal Impacts of AI and Digital Technology, and the Montreal Declaration for a responsible development of artificial intelligence.

KEY DIVERSITY CHALLENGES IN DATA SCIENCE

In IVADO's main disciplines—mathematics, computer science and engineering—the most extensively researched gap is related to gender disparities. While women are very much present in academia, there are marked disparities across fields (horizontal segregation) and hierarchical levels (vertical segregation). In the sectors to which IVADO contributes, women are significantly underrepresented. In Québec, women make up 48% of the workforce but represent less than 22% of those who work in science and engineering[1]. In academics, women make up only 20.6% of mathematics, computer science and information science faculties[2]. Finally, independent of the area of study and though they are more widely represented among full-time faculty members than a decade ago, women are better represented in the earlier academic career stages. In Canada, close to half (48.5%) are assistant professors versus 27% who are full professors[3]. The disparities are even greater in natural sciences and engineering: women make up 28% of assistant professors and only 12% of full professors[4].

Available data reveal that, when considering all fields, academic faculties are less diversified than the student population and active Canadian population,

with intersectionality playing a major role: visible minority women are the most underrepresented group among full-time educators in Canadian universities[5].

While they are significant, diversity and equity issues in science extend beyond gender. Social, economic and cultural inequalities heavily impact academic success and access to higher education. While the most significant challenge in data science is attracting more women, the discipline must also reduce the barriers encountered by the least represented groups in Québec universities (in all disciplines): first generation students, Indigenous students and students with disabilities[6].

The access gap to post-secondary education faced by the members of these groups is reflected in the composition of researchers and professors. For example, in 2016, Indigenous people represented only 1.4% of Canada's entire teaching staff—a lower proportion than Indigenous workers in the active population (3.8%) and far below the undergraduate student population that identifies as Indigenous (5%).

MULTIPLE AND COMPLEX CAUSES

The underrepresentation of certain groups in data science and higher-level scientific careers is a complex issue that is shaped by a number of individual, organizational and societal factors. Broadly speaking, gender, disability and affiliation with certain social groups (Indigenous peoples, visible minorities) play a major role in the experiences of women students and educators.

Certain types of discrimination (rarely intended but which still have a real impact) persist in working and research environments through unconscious biases and biased excellence indicators.

The studies that highlight the barriers that affect certain groups, and women in particular, in their scientific studies and careers raise the following factors[7].

INDIVIDUAL FACTORS

Work/family balance, fewer publications, responsibilities and missions and less mobility during maternity, smaller presence in formal and informal networks, stereotypes and self-censorship.

ORGANIZATIONAL FACTORS

Recruitment and promotion processes, composition of selection committees, policies, procedures and academic culture, unconscious biases.

SOCIETAL FACTORS

Gender division in fields, socialization, lack of awareness of issues, lack of models.

BENEFITS OF DIVERSITY AND INCLUSION

Years of research have shown that diversity yields economic benefits, as well as benefits relating to governance improvement, talent access and innovation[8].

EQUITY AND SOCIAL JUSTICE

Promoting diversity and inclusion firstly addresses issues related to equity and social justice. In addition, skills development in IVADO's areas of expertise opens extraordinary avenues for employment and opportunities for members of groups that are traditionally underrepresented in academia.

ECONOMIC PROSPERITY AND TALENT ATTRACTION

Considering the scope and nature of data science in the economy, graduates in the field are a key component of our innovation system. Still, a major labour shortage in data science is expected, and all members of underrepresented groups can help mitigate the gap . Accounting for diversity (and gender diversity in particular) when recruiting new students and professors will help broaden the recruitment pool and thus better develop talent.

In addition, given the international competition between research institutions, it is critical that research and work environments remain welcoming and inclusive in order to attract and retain leading talent from around the world. When organizations consider diversity and inclusion, they foster a deeper sense of self-esteem and belonging among their employees. In contrast, failing to consider these issues can lead to increased isolation (especially for members of non-majority groups) and the sense that one is not valued.

RESEARCH EXCELLENCE AND CAPACITY TO INNOVATE

Diversity and inclusion have a positive impact on the innovation led by research and development teams. They strengthen the collective intelligence and help reduce the risks associated with group think. The biases built by our societies and rooted in our research institutions affect knowledge generation in science and technology. Failing to consider them therefore limits excellence objectives in science and technology and the potential benefits to society. Addressing diversity in research and development, when relevant, serves to increase the quality and effectiveness of the scientific plan for data science research.

"As digital technologies and, in the very near future, artificial intelligence become widely present in our lives, this lack of diversity can lead algorithms to reproduce often unconscious cognitive bias in programme design, data analysis and the interpretation of results. One of the major challenges of AI is ensuring greater representation within our societies."

Cédric Villani, For a Meaningful Artificial Intelligence, March 2018

OBJECTIVES AND PRIORITIES OF THE FRAMEWORK

Our framework aims to ensure equity and diversity at several levels: talent representation (priority 1), institutional culture (priority 2) and knowledge generation (priority 3)[9].

PRIORITY 1
TALENT ATTRACTION, REPRESENTATION AND DIVERSIFICATION

Priority 1 aims to diversify the data science talent pool. It involves specific measures to directly and indirectly support members of underrepresented groups who are studying or beginning or planning to begin a career in data science. While the programs developed as part of this priority are critical to bridge the disparities and gaps in data science, additional efforts are required, since the programs will not necessarily impact the structural and institutional obstacles faced by underrepresented groups in their scientific studies and careers. Research has shown that scientific institutions must change how they operate in order to increase EDI in our fields.

PRIORITY 2
INSTITUTIONAL PRACTICES, CULTURES AND PROCESSES

Priority 2 aims to make the cultures of scientific and academic environments more inclusive. The programs developed as part of this priority seek to (i) raise awareness among members of the scientific community, (ii) understand the systemic obstacles that prevent members of underrepresented groups from entering research and (iii) create inclusive study and research environments.

PRIORITY 3
KNOWLEDGE GENERATION AND INNOVATION

Priority 3 aims to promote data science as a potential means to improve the well-being of individuals and communities. Data and knowledge generation are rarely neutral. They integrate social values, and the resulting technologies may then reproduce biases. Canadian universities and funding agencies recognize that accounting for biases (and especially biases related to gender) in research, where relevant, increases the quality and scientific effectiveness of research and therefore contributes to scientific excellence.

These three priorities are interdependent. It is impossible to promote diversity (priority 1) without ensuring true inclusion (priority 2) and reflecting on the social impacts of innovation and knowledge generation (priority 3).

The overarching objective of this framework is to define the principles of equity, diversity and inclusion as IVADO's cross-cutting challenge and integrate them into the institute's mission and activity sectors to grant them the importance they deserve and ensure they become essential quality criteria for scientific excellence.

PRIORITY 1
ATTRACTION, REPRESENTATION AND DIVERSIFICATION

OBJECTIVE

Increase the impact and tangible societal benefits of data science research and innovation.

IVADO regards diversity and equity as key elements of excellence to attract and retain leading talents and ensure a range of research perspectives.

The framework's first priority aims to implement specific actions across the pipeline to diversify the student population (1.1) and faculty (1.2) in order to promote the talents in our ecosystem and provide them with greater visibility (1.3).

Several support programs may serve to diversify scientific settings: awareness building about study programs and careers, targeted scholarships to foster the access and retention of students from underrepresented groups, funding for faculty positions, mentorship programs and activities, outreach and visibility opportunities, strict rules when assembling members of research projects and scientific committees.

1 REACH STUDENTS FROM DIVERSE BACKGROUNDS AND RAISE AWARENESS AMONG NEW DATA SCIENTISTS

A. Integrate EDI and best practices into scholarship programs

Social, economic, cultural and gender-based inequalities heavily impact academic success and access to higher education. While the most significant challenge in data science is attracting more women, we must, at our level, also help reduce the barriers encountered by the groups that are least represented in Québec universities (in all disciplines): first generation students, Indigenous students and students with disabilities.

B. Develop a scholarship program for data science students in Africa

According to the International Development Research Centre (IDRC), data science development could contribute to sharpening international inequalities to the detriment of the world's poorest countries. Supporting young data scientists in Africa is a means to help reduce the international digital and technological divide.

C. Support initiatives to raise awareness of study programs and careers in data science among members of underrepresented groups

Guidance in scientific careers and academic research begins before university, and it is therefore important to raise awareness of study programs and career opportunities. Very early on, the way children are socialized and common stereotypes can fail to encourage and support young people to aspire to a future in a field that is perceived as non-traditional. Moreover, young people are often misinformed about the career opportunities that are open to them in computer science and mathematics.

2 | REACH AND ATTRACT A DIVERSITY OF PROFESSORS AND RESEARCHERS

A. Engage academic members in implementing selection and recruitment processes that consider EDI

B. Support researchers from underrepresented groupss

In addition to providing direct support to researchers from underrepresented groups, a number of practices (some of which are promoted by Canadian funding agencies) may be implemented to sustainably foster equitable research settings at a number of levels (drafting and release of offers, awareness building among recruitment committee members of unconscious biases, parity between men and women on selection committees, retention, etc.). Expanding the talent pool to broaden perspectives and strengthen excellence is among the key issues this initiative seeks to address. Diversity among faculty members means a greater range of models for young data scientists.

3 | ENSURE THESE GROUPS ARE VISIBLE AND CAN ACCESS OPPORTUNITIES

A. Integrate EDI into IVADO's communications

B. Set out EDI guidelines for the events organized and supported by IVADO

In 2017, the percentage of women who contributed to the three leading international machine learning conferences was only 12%. To ensure the equal reach and representation of talent in data science, it is critical to focus on parity at events and support opportunities to provide more visibility to groups that are underrepresented in data science.

PRIORITY 2

INSTITUTIONAL PRACTICES, CULTURES AND PROCESSES

OBJECTIVE

Address the structural and institutional obstacles faced by groups that are underrepresented in data science to foster the development of an inclusive research culture and retain talents throughout their studies and careers.

University practices can have a detrimental effect on the career development of women researchers. This priority aims to take concrete actions to address the unconscious prejudices and biases in our community. Among the initiatives that will be set in motion are the creation of committees made up of an equal number of men and women, awareness building on the implicit biases among members of recruitment committees and the consideration of career interruptions in the review process to make scientific careers more compatible with parenthood.

1 ANALYZE DATA, CONSULT THE COMMUNITY AND DETERMINE ISSUES

A.   **Analyze our data**

B.   **Consult the IVADO community**

C.   **Review the EDI framework based on the data and feedback from community members**

Integrating EDI into IVADO's practices and policies requires the development a blueprint for change to which each member can adhere and contribute. IVADO's academic members do not currently benefit from specific findings that determine the systemic obstacles to the attainment of the EDI objectives. The first step involves analyzing our own data on diversity, and the situation of underrepresented groups in particular, to elicit perspectives to understand the barriers and levers linked to academic studies and careers to establish effective solutions and attain our objectives . Consultation, recruitment assessment and the advancement and retention of members of underrepresented groups already demonstrate IVADO's commitment to diversity.

2 PROVIDE TRAINING AND BUILD AWARENESS

A. Lead EDI awareness-building workshops and training sessions

B. Organize events on EDI issues in academia and data science

Changing the perceptions, attitudes, behaviours and stereotypes toward underrepresented groups in science is certainly one of the most structuring levers to sustainably promote EDI and involves actions including awareness-building training and activities on equity and unconscious biases, especially among members of selection committees.

3 DEVELOP POLICIES AND PROCESSES

A. Adapt policies and processes based on the outcomes of the consultations

B. Release and promote the framework and related reports

C. Support cooperation between Québec universitiess

To eliminate the barriers to fair talent representation and participation in science, we must adopt and promote policies, practices and programs. These adaptations will largely depend on the consultations with members of the IVADO community.
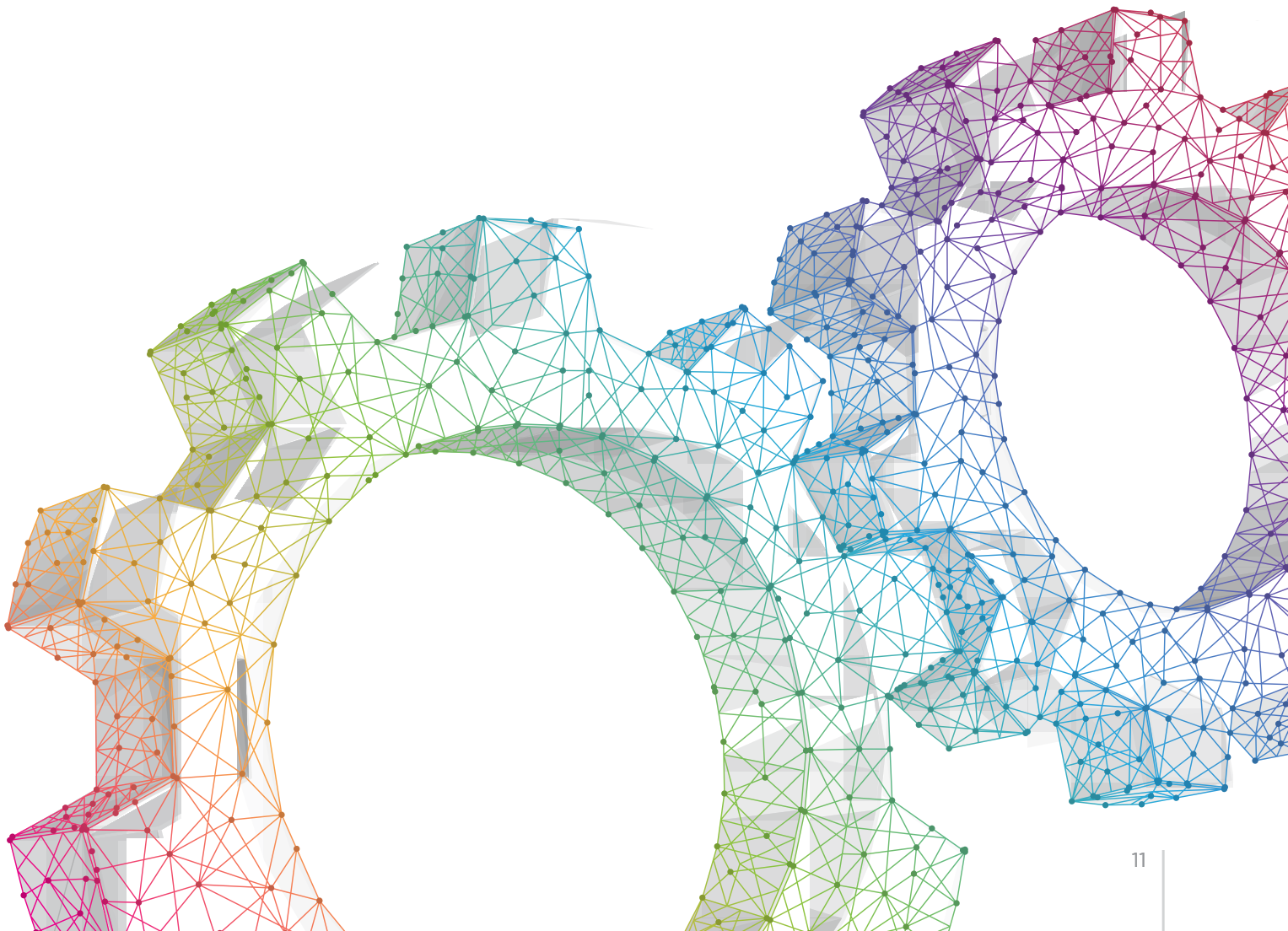
PRIORITY 3

KNOWLEDGE GENERATION AND INNOVATION

OBJECTIVE

Increase the impact and tangible societal benefits of data science research and innovation

The phenomenal growth of data and development of new analysis algorithms have led to powerful decision-making tools. Recent studies (and public controversies) have highlighted the fact that certain technologies stemming from data science research further entrench biases and discrimination based on factors including gender, ethnic original and social background. In Europe, the Villani report on artificial intelligence encourages sector stakeholders to support projects to remove the biases in the data used by learning algorithms: "With regards to AI, a policy of inclusion should thus fulfill a dual objective: ensuring that the development of this technology does not contribute to an increase in social and economic inequality; and using AI to help genuinely reduce these problems."

Broadly speaking, the benefits of integrating EDI principles and values as pledges of the quality and usefulness to society of research and innovation will help optimize the benefits and reach of the projects supported by IVADO. As major industry stakeholders are committing to taking action on these issues, the institute must do its part as well.

1   **CONDUCT RESEARCH**

A. Integrate EDI as selection criteria to assess IVADO research projects

B. Support research projects in data science-related EDI issues

The grant applications in which researchers must account for EDI principles in their projects and teams contribute to scientific excellence and bring about changes in scientific cultures in favour of EDI and interdisciplinarity. In addition, data science holds tremendous potential as a social good that must be supported and further developed.
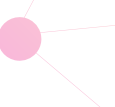
2   LEAD TRAINING

A.   **Create training sessions on biases in data science**

B.   **Support training initiatives in data science to benefit society**

To better integrate EDI considerations into data science, it is important for our ecosystem (industry members, researchers and students) to engage on EDI issues, specifically by developing and supporting training that will eventually push curriculums forward.

3   DISSEMINATE KNOWLEDGE AND RAISE AWARENESS AMONG CITIZENS

A.   **Organize and support events on issues related to EDI biases in data science research**

B.   **Promote projects related to EDI and data science**

Knowledge exchange and sharing are key elements of IVADO's mission. In this context, it is important to support data science projects that account for gender and diversity.

DEFINITIONS

The following definitions reiterate or are rooted in those adopted by the Natural Sciences and Engineering Research Council of Canada in the Guide for applicants: considering equity, diversity and inclusion in your application[10]. *Still, the understanding of the concepts of equity, diversity and inclusion is likely to evolve as this plan is implemented and IVADO gathers feedback from community members.*

DIVERSITY

Diversity consists of the conditions, expressions and experiences of different individuals and groups identified by age, education, sexual orientation, parental status/responsibility, immigration status, Indigenous status, religion, disability, language, race, place of origin, ethnicity, culture, socioeconomic status and other attributes.

Therefore, diversity is a complex and multidimensional concept that covers aspects relating to individuals (personality, learning style and life experience) and society (cultural and ethnic origin, language, class, age, gender, sexual orientation, physical and mental ability, family responsibilities, cultural, political and religious affiliation). Diversity is often linked to visible dimensions but also touches upon a number of invisible ones: thoughts, perspectives, life experiences including, for example, education, family circumstances, values and aspirations.

Recognition and promotion of diversity are key to foster academic success and the development of healthy work environments. They must be supported by concerted efforts toward inclusion, ensuring that all people are made to feel valued, respected and support equally (see the definition of inclusion).

INCLUSION

Inclusion refers to an intentional process to commit to diversity so that each member of the academic community is given the opportunity to take part in and actively contribute to the university's progress and receive the same recognition.

Therefore, diversity is a fact, while inclusion refers to intentional efforts and concrete actions to create an environment in which "all people are respected equitably and have access to the same opportunities. Organizationally, inclusion requires the identification and removal of barriers (e.g. physical, procedural, visible, invisible, intentional, unintentional) that inhibit participation and contribution."[11] To be real and sustained, inclusion must be reflected in university leadership, governance, teaching, research, employment and community activities.

Inclusion also requires that organizations affirm the values and principles of equity, justice and respect and remain open to different opinions and perspectives. This openness is achieved by acquiring an understanding of other cultures, experiences and communities and investing conscious efforts to be welcoming, helpful and respectful of everyone.

EQUITY

Equity involves treating all members of the academic community with fairness, impartiality and transparency, while recognizing the existence of advantages and barriers that place community members at different starting points.

Therefore, equity is a process (institutional processes, resource allocation, selection and recruitment) that begins by recognizing these inequalities and ensuring that sustained efforts are invested to address the imbalances. The search for equity includes the development of opportunities for groups that are currently and historically unrepresented so that they may fully and fairly take part in academic life.

"It means ensuring that the processes for allocating resources and decision making are fair to all and do not discriminate on the basis of identity. There is a need to put measures in place to eliminate discrimination and inequalities, which have been well described and reported, and ensure, to the best degree possible, equal opportunities. Equity is needed to achieve equality. For example, treating people as equals in an environment in which historical and systemic disadvantages prevent people from operating as equals can be inequitable—it lacks the fairness of a truly equitable situation."[12]

GENDER AND SEX

Gender refers to the social constructed roles, behaviours, expressions and identities of girls, women, boys, men and people with diverse gender identities. It influences how people perceive themselves and each other, how they act and interact and the distribution of power and resources in society. Gender is usually conceptualized as binary (girl/woman and boy/man), yet there is considerable diversity in how individuals and groups understand, experience and express it.

Sex refers to a set of biological attributes in humans and animals. It is primarily associated with physical and physiological features, including chromosomes, gene expression, hormone levels and function and reproductive-sexual anatomy. Sex is usually categorized as female or male, but there is variation in the biological attributes that comprise sex and how those attributes are expressed.

INTERSECTIONALITY

Intersectionality recognizes that inequities are never the result of single, distinct factors. Rather, they are the outcome of intersections of different social locations, power relations and experiences. Intersectionality pertains to the situations of people who experience several types of discrimination and oppression simultaneously.

UNCONSCIOUS BIAS

An unconscious bias is an implicit attitude, stereotype, motivation or assumption that can occur without one's knowledge, control or intention. Unconscious bias is a result of one's life experiences and affects all types of people. Everyone carries implicit or unconscious biases. Examples of unconscious bias include gender bias, cultural bias, race/ethnicity bias, age bias, language and institutional bias. Decisions made based on unconscious bias can compound over time to significantly impact the lives and opportunities of others who are affected by the decisions one makes.

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9. These gateways to promote EDI in scientific settings are largely based on the work conducted by Londa Schiebinger, history of science expert at Stanford University. In her approach, she sets out three levels, which she calls fixes: fix the numbers, fix the institutions, fix the knowledge. IVADO's framework and three priorities are largely based on this concept.

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11. *Ibid.*

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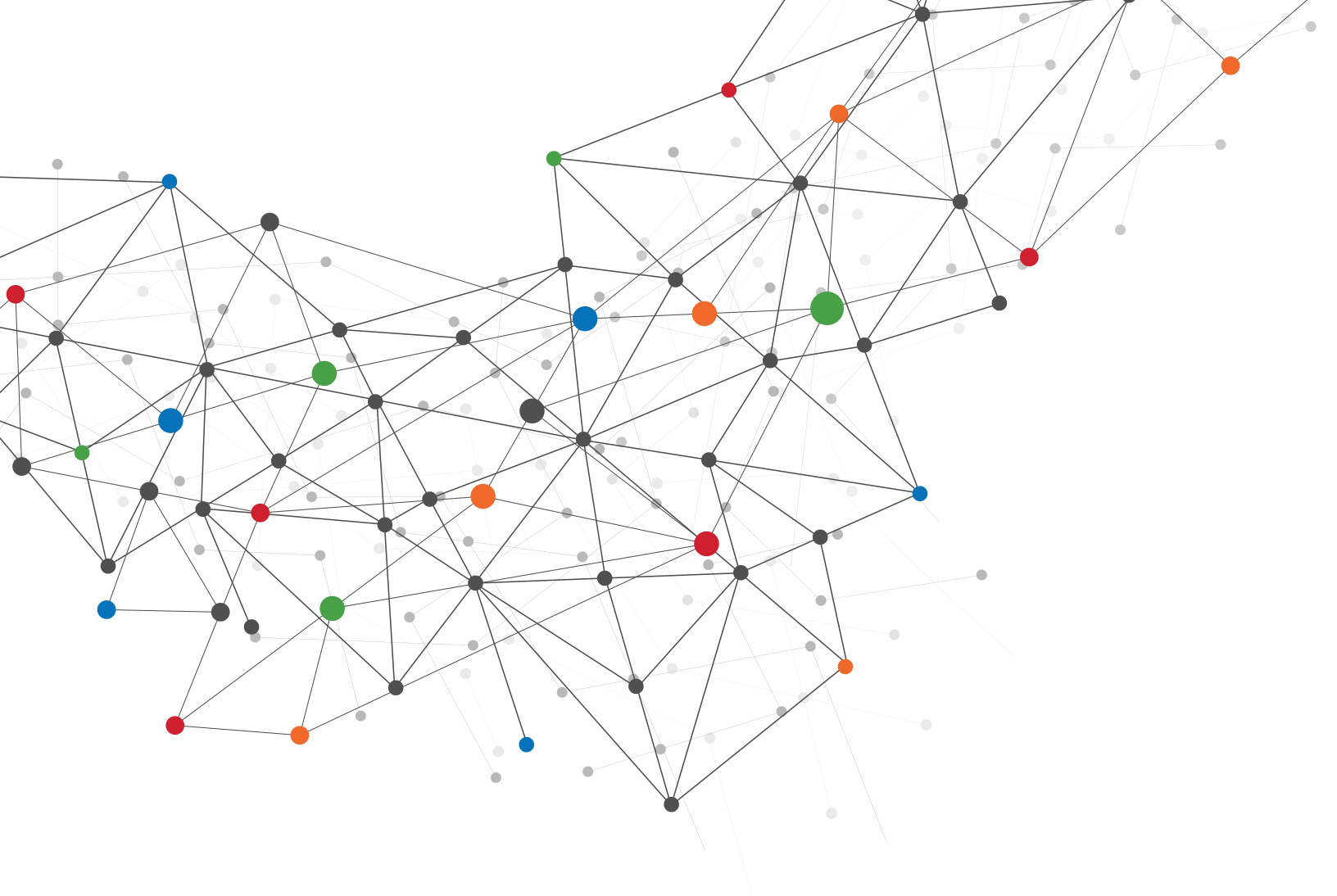
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FOR ALL & BY ALL

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