Artificial Intelligence Competency Frameworks:
A success pipeline from College to University and Beyond

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Outline

- Introduction

- Context

- Competency Framework (goal and audience)

  o Guiding Principles

  o Competency Framework - sample

- Integrated into a Cégep certificate

  o Application: Program of study (e.g.: Science)

- Key Takeaways

Introduction

PIA (**Pôle montréalais d'enseignement supérieur en intelligence artificielle**) was created to ensure that college and university programs remain aligned with industry needs and to shed light on the social and ethical considerations related to the rise of AI.

By mobilizing its members, including representatives from nearly 20 colleges and universities, and partnering with leaders from the AI community, PIA aims to support post-secondary institutions so that they can effectively create and update academic programs in order to reflect current and future AI needs.

https://poleia.quebec/en/about/

Context: PIA Grant Goals

- **Outline an AI competency framework** for college, university, and mid-career learners to support the acquisition of technical, business and human skills while integrating an ethical perspective.

- **Address talent shortage** and build capacity collaboratively.

- Explore the substructure of success pipelines **for learners at different stages** in AI fields across institutions.

Context: Roadmap for AI Competency Framework

- Establish shared Community of Practice between Concordia and Dawson

- Conduct a needs assessment (*available on request*)

- Develop the AI competency framework

- Consult with institutions on medium and long-term strategies for integrating the competencies across STEM and non-STEM disciplines

- Strategize on training and professional development as part of capacity-building exercises for delivering the competencies

- Share findings of the project: tools, reporting and presentations

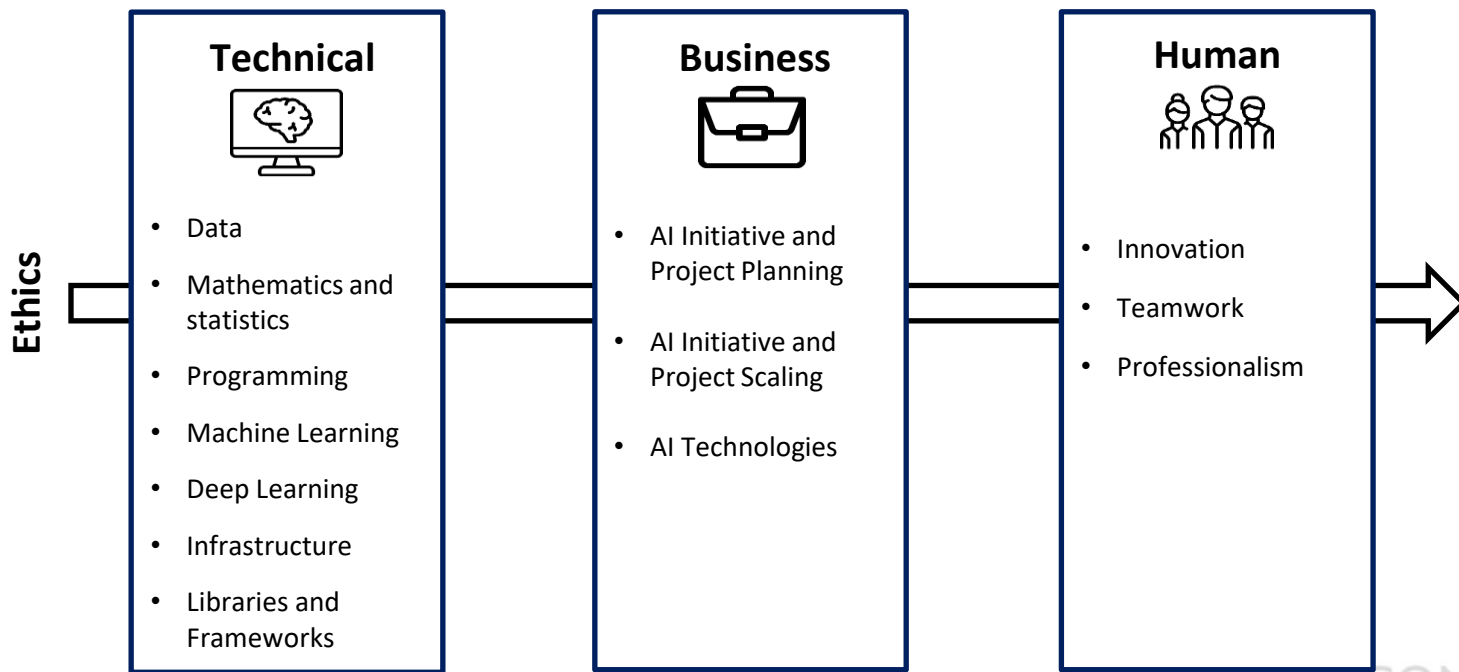# Context: Establishing a Community of Practice

PIA Advisory Committee

Tamara Vandersluis, R2i.ca

Iulian Serban, Korbit Technologies

Aubert Sigouin-Lebel, TechnoCompetence

René Breyel, AIoT Canada

Philip Mitsopoulos, Stradigi AI

Vince Iannotti, Nuance Communications

Brandiff Caron, Concordia University

Benoit Desgroseillers, Finance Montreal

Mike Deutsch, Kids Code Jeunesse

Michel Charest, Ville de Montréal

PIA Grant Team

Rob Cassidy, Concordia

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Competency Framework: Goal

Goal: Outline the **CORE** competencies required by AI practitioners in the technical, business, and human domains. With ethics being foundational to the AI field and the work of AI practitioners, ethical competencies have been integrated into the framework.

Ethics

Technical

- Data
- Mathematics and statistics
- Programming
- Machine Learning
- Deep Learning
- Infrastructure
- Libraries and Frameworks

Business

- AI Initiative and Project Planning
- AI Initiative and Project Scaling
- AI Technologies

Human

- Innovation
- Teamwork
- Professionalism

Competency Framework: Audience

Primary Audience

- **Educators**
  - Higher education faculty teaching in technical fields
  - Higher education faculty looking at integrating AI competencies in the curriculum

- **Program Developers**
  - Curriculum developers
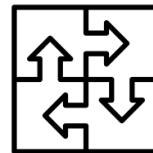 - Instructional designers

Secondary Audience

- Program Administrators of artificial intelligence courses and programs
- Student Success centers looking at developing complimentary trainings for technical or non-technical students
- Material writers for the AI domain
- Training managers and human resource managers
- Career planning professionals

Competency Framework: Guiding Principles

Rigorous

Integrated

Community built

Human-Centered

Accessible

Competency Framework: Guiding Principles

Created in collaboration with the Montreal AI and educational ecosystem including:

- Instructional designers

- Industry experts

- CEGEP & university professors

Community built

Competency Framework: Guiding Principles

The competency maps were developed using a rigorous process:

- Developed in multiple iterations

- Multiple levels of internal review (subject matter experts & instructional design)

- Two levels of external review (subject matter experts & instructional design)

Rigorous

Competency Framework: Guiding Principles

The competency framework outlines more than just the AI technical competencies:

- Strong emphasis in outlining the human/professional competencies one would need to excel in the field of AI
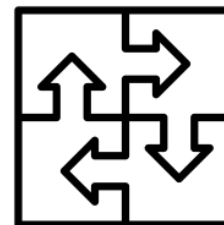
Human-Centered

Competency Framework: Guiding Principles

Ethics is carefully integrated into the competency framework:

- Ethical considerations and practice is critical to the field of AI. Rather than treat ethics as a separate domain, this competency framework takes an integrated approach. Specifically, ethical competencies are interwoven into the technical, business and human domains in order to demonstrate how ethical considerations are foundational to the AI field.
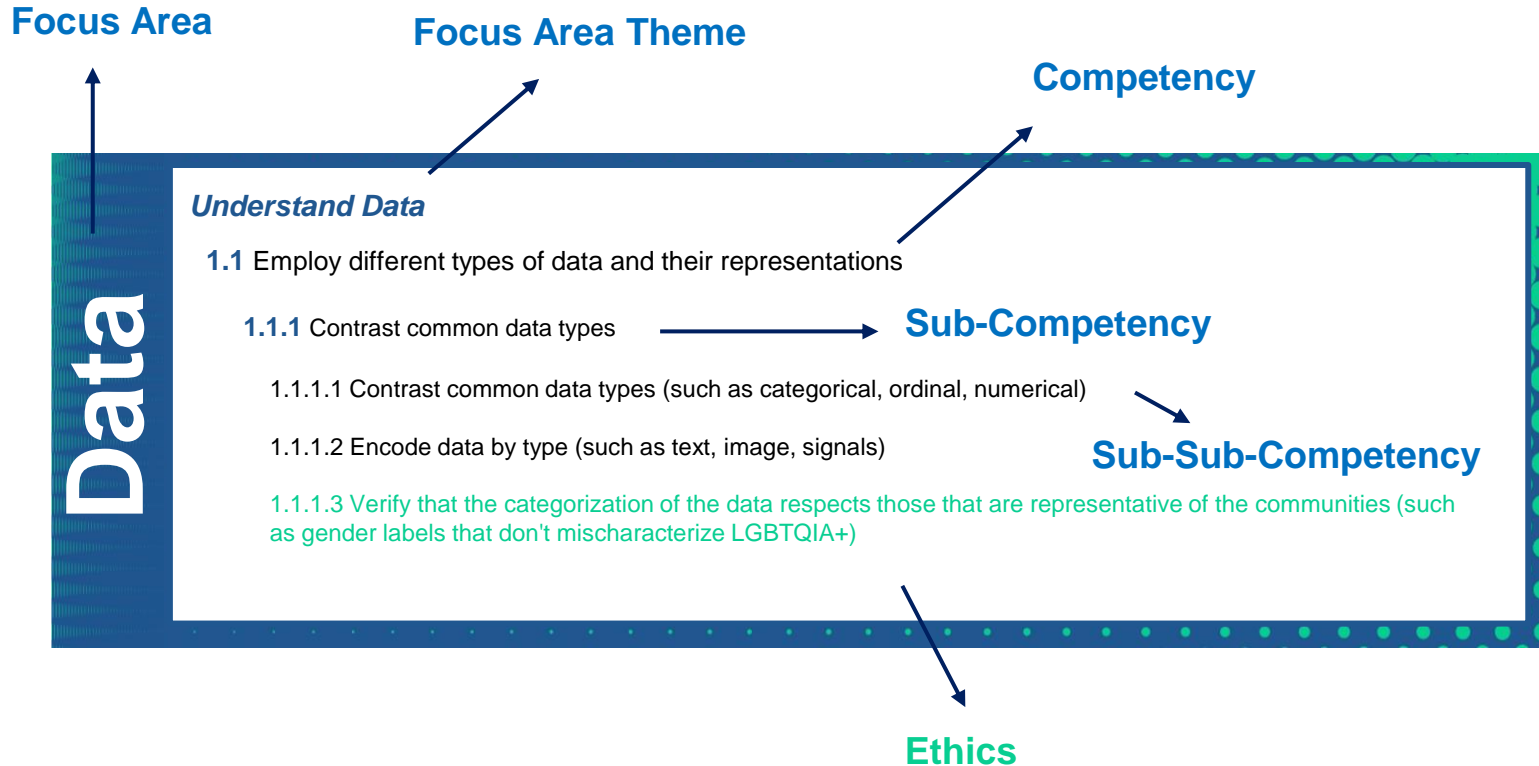
Integrated

Competency Framework: Guiding Principles

Careful design decisions were made to render the competency framework more accessible to a non-technical audience:

- Focus areas and focus area themes are used to help non-technical readers navigate the competency framework

- Competencies, sub-competencies and sub-competencies are written in clear, concise and actionable ways

- A glossary is provided to define technical terms for non-technical readers

Accessible

Competency Framework: Sample

Focus Area

Focus Area Theme

Competency

Understand Data

1.1 Employ different types of data and their representations

1.1.1 Contrast common data types → **Sub-Competency**

1.1.1.1 Contrast common data types (such as categorical, ordinal, numerical)

Sub-Sub-Competency

1.1.1.2 Encode data by type (such as text, image, signals)

1.1.1.3 Verify that the categorization of the data respects those that are representative of the communities (such as gender labels that don't mischaracterize LGBTQIA+)

Data

Ethics

Application: Science Program 200.B0

Term I	Term II	Term III	Term IV
Mechanics	Waves & Modern Physics	Electricity & Magnetism	Option
General Chemistry	Chemistry of Solutions	General Biology	Probability & Statistics `Theme 1`
Calculus I `Theme 3.1`	Calculus II `Theme 3.2`	Linear Algebra `Theme 2`	Programming `Theme 4 - Numerical methods` `Theme 1.1 - Write code` `Theme 3 - Data operations` `Theme 4 - Data representation` `Theme 1 - Feature engineering` `Theme 2 - Machine learning`
English	English	English	English
PhysEd	PhysEd	PhysEd	French
Humanities	Humanities `Theme 1 – AI in society` `Theme 2.2 - Ethics of data`	Complementary	Humanities
Complementary	French		

AI Technical Focus Areas: `Data` `Math & Stats` `Programming` `Machine Learning` `Deep Learning` `Infrastructure`

Application: Concordia Continuing Education (CCE)

Goal: To get learners ready for the workplace (Upskill, reskill, transition)

360⁰ profile = technical + business + human

How:

- Curriculum

- Assessment strategy (Authentic assessments, project-based learning)

- Work Integrated Learning (WIL) opportunities (personal projects/internships/consulting projects)

- & Other

Key Takeaways

- The competency framework acts as a springboard for various educational roles including educators, program developers, recognition of prior learning and others involved in the program development process from inception to implementation.

- Since ethics is foundational to the AI field and the work of AI practitioners, these competencies have been integrated into the technical, business and human domains.

- AI fields are developing rapidly: keep an eye toward lifelong-learning and maintaining flexibility to update programs.

THANK YOU

Interested in finding out more?
Contact us for future updates!

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