Final Assessment Report (FAR) and Implementation Plan

Periodic Program Review (PPR)

Graduate Program in Data Science and Analytics (MSc)

Last Updated: Mar 3, 2025

FINAL ASSESSMENT REPORT

In accordance with the University Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response and assessments of the graduate program in **Data Science (MSc).** This report identifies the peer review identified strengths of the program, together with opportunities for program improvement and enhancement, and it sets out and prioritizes the recommendations that have been selected for implementation.

The report also includes an Implementation Plan that identifies who will be responsible for approving the recommendations set out in the final assessment report; who will be responsible for providing any resources entailed by those recommendations; any changes in organization, policy or governance that will be necessary to meet the recommendations and who will be responsible for acting on those recommendations; and timelines for acting on and monitoring the implementation of those recommendations.

EXECUTIVE SUMMARY

The current degree program in MSc in Data Science and Analytics has attracted significant interest since its inception in Fall 2016, and received nearly 1,000 applications for the Fall 2020 admission cycle. Every year some MRP work has been published as conference and journal papers at academic venues. There are several graduates of this program who are now PhD students at Toronto Metropolitan University and elsewhere. With the growing interest in the Data Science field, both in academics and industry, it would be expected to have even further increased interest in the program.

Since its inception the program has added both a thesis and hybrid delivery options. By adding the thesis option, the program was able to attract high quality research students who are funded by the faculty advisors. These students contribute to the research activities at an elevated level as they are required to complete master thesis as a part of their degree requirements. Considering that many PhD

programs require a Thesis-based master degree, a large number of students who aim to pursue PhD studies are interested in the Thesis-based stream.

By adding an online option to the current degree program, it has become possible to attract a large number of high quality students who otherwise might not have the opportunity to attend such a program (e.g., due to distance to the campus or busy work schedules in the case of part-time students). Attracting a larger volume of students contributes to the quality and reputation of the program.

Flipped classroom settings are particularly suitable for this master program due to the heavy focus on hands-on experience with data science tools and methodologies. Because the students are asked to review the course materials that are prepared by the instructor before the lectures on their own time, more time is devoted to Q&A's and exercises. Additionally, having a uniform set of lecture materials developed by instructors (used in flipped classroom settings) enhances the teaching experience for subsequent instructors, and facilitates a high-quality learning environment. Including the online option also positions the program better to future uncertainties brought up by the post-pandemic world.

The graduate program has a number of important strengths. Since the inception of the program, our graduate students have been extremely successful at securing data science related jobs in industry and government. The ones who wanted to continue with further research were also very successful in getting acceptance to PhD programs. Few students withdraw or leave the program, and several students are very productive researchers with hundreds of publications in scholarly journals and presentations at conferences that came out of their MRP or thesis work.

There are some challenges and opportunities for the graduate program. It is important to extend the pilot of international student recruitment with proper stipend support to accommodate the cost of living in Toronto. Given the continuously increasing demand for this program, hiring of two new full time core faculty would enhance the sustainability of the program.

PERIODIC PROGRAM REVIEW AND PEER REVIEW TEAM

The graduate program in **Data Science (MSc),** submitted a Self-Study Report to the Yeates School of Graduate & Postdoctoral Studies that outlined program descriptions and learning outcomes, an analytical assessment of the program, program data including data from student surveys and the standard data packages. Course outlines and CVs for full-time faculty members were also appended.

Two external and one internal arm's-length reviewers were selected from a set of proposed candidates. The Peer Review Team (PRT) for the Periodic Program Review (PPR) of this graduate program consisted of Dr. Olga Baysal (Carleton University), Dr. Periklis Andritsos (University of Toronto), and Dr. Halis Murat Yildiz (Toronto Metropolitan University).

The PRT site visit was conducted virtually on November 25-25, 2024. A virtual site visit was deemed appropriate due to the highly online nature of the program's delivery.

The visit included interviews with the University and Faculty Administration including the Provost and Vice-President Academic, Vice-Provost and Dean Yeates School of Graduate & Postdoctoral Studies (YSGPS); Associate Dean Programs YSGPS, Graduate Program Director of the Graduate Program, Director Graduate Program Administration, and meetings with Faculty, a group of current students, administration, and support staff. As this is an interdisciplinary program involving various Faculties and Schools across TMU, it is housed in the YSGPS.

The PRT report was communicated to the Associate Dean, YSGPS on Dec. 10, 2024, and a response to the report from the graduate program was communicated on Jan. 30, 2025. The responses of the Program and the YSGPS were revised after feedback received during the meeting of the Programs and Planning Committee (PPC) on Feb 24, 2025. This response reflects those revisions. This was then approved by YSGPS Council on March 5, 2025.

PROGRAM STRENGTHS, WEAKNESSES, AND OPPORTUNITIES

The PRT cited some strengths of, and opportunities for, this graduate program.

Strengths:

Appropriateness of Structure: The program's structure, including required and elective courses, is well-designed to meet its objectives, program-level learning outcomes, and Graduate Degree Level Expectations (GDLEs).

Mode of Delivery: The hybrid delivery mode is effective in facilitating student learning and engagement, particularly for working professionals and international students overseas.

Curriculum Effectiveness: The curriculum reflects current trends and practices in the data science field, ensuring students are well-prepared for industry demands. This was confirmed from our chats with several alumni with strong achievements.

Resource Effectiveness: The amount of students that have applied and been admitted every year for the program is striking, given that many graduate programs have suffered in recent years. This success has been achieved with limited full-time faculty members and resources.

Areas for Improvement:

Need for More Full-Time Faculty: The program's reliance on CUPE instructors and the limited number of core faculty members (1.5 FTE) pose challenges to sustainability and quality. The program director handles admissions alone, which adds to the administrative burden and leaves a question mark for sustainability in the near future. Hiring four additional full-time faculty members is crucial to support the program's growth, enhance teaching quality, and reduce the reliance on part-time instructors. This will also allow for a more balanced distribution of responsibilities and supervision time and improve the overall academic environment.

Improved Student-Supervisor Matching: A more organized system, such as a central website with project descriptions, could improve the matching process and enhance student satisfaction. An early live

meeting with students and all affiliated faculty members would help when students decide on their topics and who to approach in the MRP.

Financial Challenges: Addressing financial challenges faced by students due to the high cost of living in Toronto is essential. This includes exploring additional funding opportunities (e.g., co-op placements) and scholarships.

Alumni Association: Although the program is at an early stage, establishing an alumni association would help students with their job prospects.

More structured office hours and separate lab hours: One common theme from our meeting with the students is that they want more office hour time to address their questions and separate the lab hours from lecture hours to digest the material better. In hybrid programs, these are usual pressing issues.

Opportunities for Enhancement:

International Student Recruitment: Formalizing an international student recruitment strategy and providing adequate support for these students will enhance the program's diversity and global reach.

Deans' Steering Committee: Establishing a Deans' Steering Committee to address strategic matters and resource allocation will strengthen program governance and support.

Expanded Elective Offerings: Increasing the number of elective courses and introducing co-op opportunities to enhance student learning and career readiness.

Industrial Advisory Board: Forming an Industrial Advisory Board (possibly inviting alumni) to offer "advice" and improvements on the current curriculum for the program to offer in-demand skill training so that graduates stay relevant in the Canadian job market.

Incentivize Faculty Participation in the Program: The program may want to consider the MRP supervision by affiliated faculty members as a service by their home units.

SUMMARY OF PRT RECOMMENDATIONS, GRADUATE PROGRAM AND YSGPS RESPONSES, AND IMPLEMENTATION PLAN

A report on the progress of these initiatives will be provided in the Follow-up Report which will be due in one year from the date of Senate approval.

PRT Recommendations	PRT Rationale	Data Science and Analytics Program Response	Proposed Program Action	Program Timeline and Responsibility/Lead	YSGPS Response
Recommendation 1: Hire four additional full- time faculty members.	To ensure program sustainability, improve teaching quality, and reduce reliance on CUPE instructors. The program director's role in handling admissions further underscores the need for more faculty support.	We agree that this recommendation is important for the sustainability of our program.	The Program will request two full-time faculty hires to support its delivery from the Provost.	The Program will request one faculty to be hired in 2026 and another in 2027.	The YSGPS agrees that additional hires to the Program are important and will continue to advocate for this as it does for all its interdisciplinary programs.
Recommendation 2: Implement a centralized student-supervisor matching system.	To improve the organization and effectiveness of the matching process, enhancing student satisfaction and research outcomes.	The program already has a list of affiliated faculty members on the program website. The students are advised to contact potential supervisors. This is coordinated within the DS 8005 and DS 8012 courses. As the number of students increases, we agree with this recommendation that the current process could be improved.	The program will update its website by including links to faculty members' websites.	The changes to the website will be implemented by the program by the end of 2025.	The YSGPS supports the Program's efforts to implement changes that will facilitate the ability of students to match with potential supervisors.

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Recommendation 3: Increase student engagement through structured activities.	To foster a stronger sense of community/cohort among students and provide additional academic and personal support.	We agree with this recommendation. The program already started acting on this recommendation that we will have an in person get-together with the students	The program every year will plan such activities.	Effective immediately through program-planned activities.	The YSGPS supports the Program's plans to enhance the student experience by offering greater opportunities for engagement. As part of this, the YSGPS has worked to establish a dedicated area on the 7th floor of the Daphne Cockwell Centre (DCC)for interdisciplinary graduate programs, including event space. The YSGPS will coordinate with the Program to ensure that it meets the needs of its users and contributes to a positive student experience.
Recommendation 4: Formalizing an international student recruitment strategy.	To provide adequate support for the international students and enhance the program's diversity and global reach.	We agree with this recommendation.	The program will work with the university's international office (TMU Global) for matters related to international student recruitment and support.	This will be an on-going effort by the Program.	The YSGPS commends the Program in its current international recruitment efforts and planned discussion with key keyholders to explore additional strategies. YSGPS is happy to be involved in these discussions and provide support where it can.