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Project Insights Report

Machine Learning and the Labour Market: A Portrait of Occupational and Worker Inequities in Canada

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Executive Summary

Machine learning (ML), a rapidly advancing subfield of artificial intelligence, is increasingly reshaping work across Canada's labour market. ML automates and augments a broad range of job tasks, including non-routine cognitive functions such as learning, prediction, and problem-solving. It represents a distinct technological shift with implications extending beyond previous automation technologies. Understanding who is most exposed to these changes is critical for developing effective and inclusive skills and workforce policies.

In partnership with the Institute for Work & Health, Future Skills Centre supported a study examining the extent to which Canadian occupations and workers are exposed to machine learning. Using national Labour Force Survey data and a novel measure of occupational suitability for machine learning, the study estimates ML exposure across occupations and analyzes how exposure varies by gender, education, wages, and job skill requirements.

The findings show that ML exposure is widespread across the labour market. Nearly all Canadian occupations include at least some tasks suitable for machine learning. Approximately 1.9 million workers, representing about 12 percent of the Canadian workforce, are employed in occupations characterized by high ML exposure. Fewer than 5 percent are employed in occupations with low exposure. These results underscore that ML is likely to influence work across a wide range of jobs, not only those traditionally considered vulnerable to automation.

The distribution of ML exposure is uneven and gendered. Women account for nearly two-thirds of workers in high-exposure occupations, reflecting persistent occupational segregation and differences in task composition. Workers in higher-wage and higher-skill occupations are generally less likely to be highly exposed, though these relationships vary by gender. Notably, women with higher educational attainment and in more senior or highly skilled roles are more likely to be employed in occupations with lower ML exposure.

Overall, the findings suggest that machine learning may reinforce existing labour market inequities while reshaping higher-skilled work. Exposure to ML does not necessarily imply job displacement, but it signals where work is most likely to change. These insights highlight the need for proactive, inclusive skills strategies that support workers, particularly those in high-exposure roles, to adapt, build complementary human skills, and benefit from the adoption of AI technologies.

KEY INSIGHTS

1. Nearly 1.9 million Canadians work in occupations with a high proportion of tasks suitable for machine learning, which indicates that potential exposure to ML-driven job change is substantial.

2. Women and workers in lower-paid, lower-skill occupations are more likely to be in high-exposure roles, reinforcing existing labour market inequities.

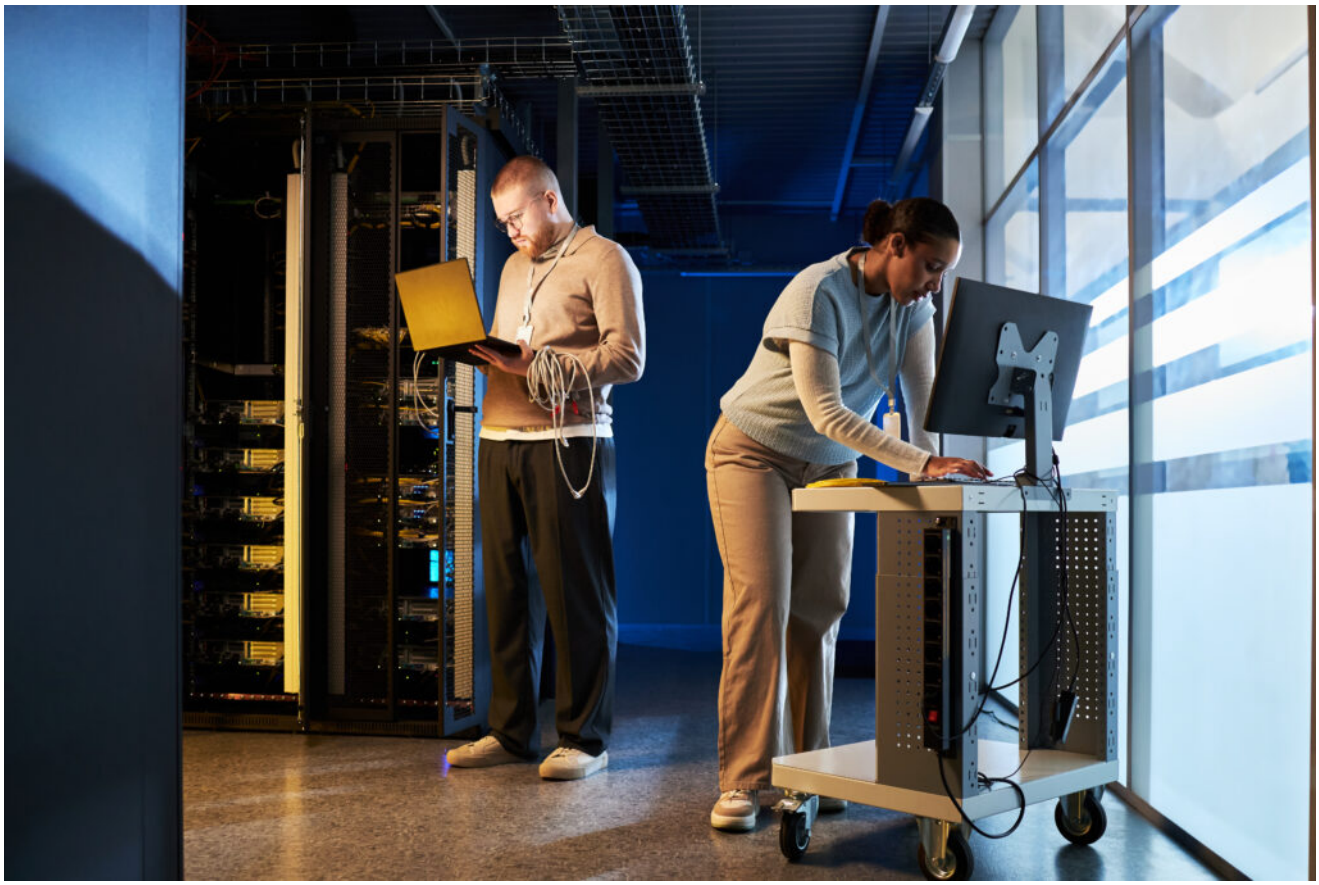
3. Higher education, wages, and skill requirements are associated with lower exposure to machine learning, suggesting that skills development and job design play a protective role as ML adoption expands.

The Issue

Machine learning (ML), a subfield of artificial intelligence (AI), is increasingly being adopted across Canadian workplaces. ML refers to the use of statistical algorithms applied to large volumes of structured and unstructured data to identify patterns and generate predictions. Firms are integrating these technologies to support innovation, automate tasks, and enhance productivity. However, the impacts of ML adoption are unlikely to be evenly distributed. Differences in occupational structure, job tasks, gender, and other sociodemographic factors shape who is most exposed and how that exposure may translate into risk or opportunity.

While the existing literature mostly examines aggregate labour market effects of AI and automation, fewer studies explore how ML exposure varies across occupations and worker groups. Understanding where ML exposure is concentrated is essential to identify workers who may be more vulnerable to disruption, as well as those who may benefit from complementary technologies. It is also important to design targeted skills and workforce development responses.

Past waves of technological change have tended to disproportionately affect workers from socially and economically disadvantaged groups, particularly through the automation of routine and repetitive tasks. Machine learning, however, represents a distinct technological shift. In addition to automating routine functions, ML is increasingly capable of performing non-routine cognitive tasks such as learning, planning, prediction, and problem-solving. These tasks are embedded in many higher-skilled, higher-paid occupations, suggesting that ML may disrupt traditional assumptions about who is most affected by technological change. At the same time, occupational gender segregation and differences in working conditions may influence how men and women experience ML exposure and its consequences.



What We Investigated

This project examined the extent to which Canadian occupations and workers are exposed to machine learning. The research sought to answer three core questions:

1. How many Canadian workers are employed in occupations characterized by high or low exposure to machine learning?
2. How does ML exposure vary by workers' socioeconomic characteristics (such as education and gender) and occupational characteristics (including wages and job skill requirements)?
3. Does gender moderate the relationship between education, job skill requirements, wages, and ML exposure?

The study used a novel analytical approach combining eight years of Statistics Canada's Labour Force Survey data (2013–2019, 2022) with an occupational measure of suitability for machine learning (SML), originally developed by other researchers. The SML measure estimates the extent to which job tasks are technically suitable for ML and was mapped from U.S. O*NET classifications to Canada's National Occupational Classification system. Occupations were categorized as having high ML exposure (top 10th percentile of SML scores) or low ML exposure (bottom 10th percentile).

Gender-stratified models were used to examine how education, wages, and job skill requirements relate to ML exposure for men and women.

Importantly, the study measures *potential exposure* to ML based on task suitability, not the actual adoption of ML technologies. This distinction is critical, as the pace, form, and consequences of ML adoption will continue to evolve as the technology advances rapidly.

✔ What We're Learning

Machine learning exposure is widespread across the Canadian labour market
Nearly all occupations include at least some tasks that could be performed by ML. Approximately 1.9 million workers, representing about 12 percent of the Canadian workforce, were employed in occupations characterized by high ML exposure, where a large share of job tasks are suitable for machine learning. In contrast, roughly 744,000 workers (4.7 percent of the workforce) were employed in occupations with low ML exposure.

The distribution of ML exposure is notably gendered
Women accounted for nearly two-thirds (63.4 percent) of workers in high-exposure occupations, while men were more prevalent in low-exposure occupations (59.9 percent). These patterns reflect broader gender segregation across occupations and task profiles, and suggest that women may be more likely to work in roles where ML could reshape how work is performed.

The relationship between ML exposure and education, wages, and skill requirements is complex
Overall, workers with higher educational attainment and in occupations with higher wages and greater skill, training, and experience requirements were less likely to be employed in high-exposure occupations. These high-exposure occupations included relatively larger shares of workers with trades certifications, diplomas, and college or bachelor's degrees. There were smaller proportions of workers with very low levels of education or with advanced graduate degrees.

Gender differences further nuanced these findings. Women with higher levels of education and those in managerial or highly skilled roles were more likely to work in occupations with low ML exposure compared to women with lower educational attainment or in lower-skill roles. This finding suggests that education and skill upgrading may provide some protective effects for women, but that these benefits are unevenly distributed.

★ Why It Matters

The findings underscore that machine learning, like previous technological transformations, has the potential to reinforce existing labour market inequities. However, ML differs in that it does not exclusively threaten lower-skilled or lower-paid work. Instead, it reshapes task bundles across a wide range of occupations, creating both risks of task substitution and opportunities for task augmentation.

The gendered distribution of ML exposure raises questions for policy and practice. Women may be more exposed to ML-related changes, but that exposure does not necessarily imply displacement. ML may complement certain tasks, increase productivity, or improve job quality. At the same time, men may be comparatively shielded from exposure in some occupations, potentially limiting their access to new opportunities created through ML adoption. These dynamics highlight the need for gender-sensitive approaches to skills development, workforce transitions, and technology adoption.

For policymakers and workforce development stakeholders, the study reinforces the importance of preparing *all* workers, not only those in traditionally "at-risk" roles, for a labour market increasingly shaped by AI and ML. Skills strategies should focus on helping workers adapt to evolving task demands, strengthen complementary human skills, and navigate transitions within and across occupations. Targeted reskilling and upskilling efforts may be important for workers in high-exposure occupations, including women in roles where ML adoption is likely to accelerate.

State of Skills:
Unleashing AI into the Skills Development Ecosystem

FSC-supported AI tools have bolstered outcomes in skills matching, career development guidance, and recruitment. The overall effectiveness of these tools was underpinned by recognizing and mitigating the inherent bias and discrimination embedded into these technologies.

Read Thematic Report

Overall, this research provides an evidence base to inform future skills policy in Canada. By highlighting who is most exposed to machine learning and why, it supports more inclusive, proactive approaches to workforce development that aim to ensure the benefits of AI are broadly shared while mitigating the risks of deepening inequality.

Have questions about our work? Do you need access to a report in English or French? Please contact communications@fsc-ccf.ca.

How to Cite This Report

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The Future Skills Centre acknowledges that the Anishinaabe, Mississaugas and Haudenosaunee share a special relationship to the 'Dish With One Spoon Territory,' where our office is located, bound to share and protect the land. As a pan-Canadian initiative, FSC operates on the traditional territory of many Indigenous nations across Turtle Island, the name given to the North American continent by some Indigenous peoples. We are grateful for the opportunity to work in this territory and commit ourselves to learning about our shared history and doing our part towards reconciliation.