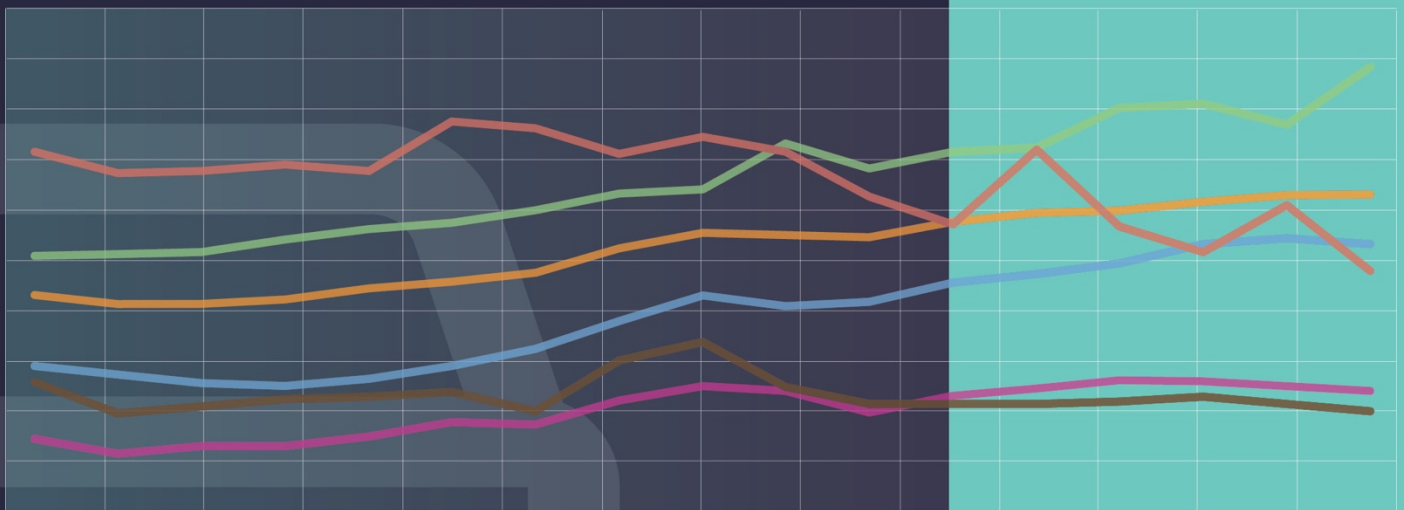


# AUTOMOTIVE INDUSTRY LABOUR MARKET ANALYSIS

## REGIONAL AUTOMOTIVE TECHNOLOGY CLUSTERS: OTTAWA CLUSTER



The project is a collaboration of the Canadian Skills Training and Employment Coalition, Prism Economics and Analysis, and the Automotive Policy Research Centre.

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[futureautolabourforce.ca](http://futureautolabourforce.ca)

**THIS PAPER** was prepared for the Auto Labour Market Information (LMI) Project, now known as the Future of *Canadian Automotive Labourforce (FOCAL) Initiative*.

The goal of the project is to help stakeholders better understand the automotive labour market. The Project will create industry-validated, regional, occupational supply and demand analyses and forecasts and skill profiles for skilled trades and other key skilled occupations in the broader automotive sector including vehicle assemblers, parts manufacturers and technology companies that supply the industry. The project will also examine various labour market trends in the sector and facilitate discussions among stakeholders about how to address any forecasted skills shortages and other labour market challenges. The planned outcome of the project is enhanced regional labour market information that will support colleges, employers, policy makers and other stakeholders in taking practical steps to address skills shortages and other labour market challenges in the automotive sector.

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## INTRODUCTION

In this series of reports, we observe the contributions of Canada's six automotive technology clusters located in Vancouver, the Greater Toronto and Hamilton Area (GTHA), Kitchener-Waterloo-Cambridge (KWC), Windsor, Ottawa and the Greater Montreal Area (GMA). In doing so, we shed light on each regional cluster's domain of technological expertise, its distribution of employment and skills, and the factors that sustain its development. Moreover, we examine the pivotal role played by Canada's automotive technology clusters in the advancement of the country's broader automotive sector through their contributions to its manufacturing capability, development of new product technologies and enhancements to product quality.

This report focuses on the automotive technology cluster located in the Greater Ottawa Area. It examines the distribution of automotive technology companies and organizations in the region, highlighting the cluster's domains of technology focus. Furthermore, using the APRC's<sup>1</sup> comprehensive automotive database and through an establishment-level approach, it maps the regional distribution of employees and individuals that are engaged in advanced automotive technology manufacturing and research & development (R&D) activities. It sheds light on the concentration of labour and skills in specific technology fields within the cluster. Finally, through a survey of occupational profiles within selected companies, this report provides details on the occupations and skill streams that are in most demand in the local labour market.

In performing the profiling and occupation analysis, we refer to FOCAL's "Canada's Automotive Technology Clusters: Labour Market Characteristics and Regional Specializations" report. That report outlines the full spectrum of current trends shaping innovation in the automotive industry and provides details on the ten main domains of technological progress in the sector. Those ten automotive technology domains include: (1) Autonomous Vehicle (AV) Technologies, (2) Connected Vehicle Technologies, (3) Artificial Intelligence & Machine Learning (AI & ML), (4) Materials & Light Weighting, (5) Battery Electric & Hybrid Vehicle Technologies, (6) Hydrogen Fuel Cell (HFC) Technologies, (7) Internal Combustion Engine (ICE) Powertrain Technologies, (8) Production Technologies, (9) Vehicle Safety & Security and (10) Other Software & Electronics.

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<sup>1</sup> APRC: Automotive Policy Research Centre

Additionally, FOCAL's report "Canada's Automotive Technology Clusters: Labour Market Characteristics and Regional Specializations" sets out the methodology that we used to identify and profile each cluster. The methodology report also provides details on the 18 automotive highly skilled occupations which are selected to examine the occupational distribution in the clusters.

## BACKGROUND ON THE OTTAWA TECHNOLOGY CLUSTER

In recent decades, the Greater Ottawa Area has emerged as one of Canada's most technologically advanced regions. With close to 1,750 technology companies and more than 10% of its workforce employed in information and communications technology (ICT), the area is a Canadian leader in various advanced technology fields, including communications, connected and autonomous vehicle solutions, software, defence and security and digital media (Invest Ottawa, 2020). The region's importance is enhanced by the numerous multinational ICT companies that it hosts such as Amazon, Blackberry QNX, Ericsson, IBM, Mitel, Nokia and Shopify.

The Greater Ottawa Area has recently emerged as an important Canadian connected and autonomous vehicle (CAV) technology development hub. The region is home to numerous companies that develop and test CAV solutions including sensors, connectivity software and other related data solutions. Those companies are anchored in the region by the presence of top enterprise software vendors and several homegrown companies. One of those homegrown companies, Blackberry QNX, has a long history of producing in-car infotainment systems and automotive cybersecurity solutions. In 2017, Blackberry QNX launched the Autonomous Vehicle Innovation Centre (AVIC) which specializes in research, development and testing of CAV technologies. In 2019, Blackberry QNX launched a \$310.5 million project dedicated to the development of cybersecurity and automotive software in the region. The project, which received \$40 million from the Canadian federal government's Strategic Innovation Fund (SIF), is expected to produce as many as 800 new jobs in the region.

The region also hosts one of Ford Motor Company's Connectivity and Innovation Centres in Kanata (the other is located in Waterloo, Ontario). Ford's Kanata Centre spearheads its research and software development of new cellular antenna technologies for CAVs. In October

2017, the company formed the centre in partnership with BlackBerry Ltd., which transferred nearly 400 employees to assist in Ford's automotive, connectivity and vehicle software R&D.

CAV innovation in the region is supported by the L5 Autonomous Vehicle Testing Facilities (Ottawa L5). Established in 2019 through a consortium between Autonomous Vehicle Innovation Network (AVIN) program, Invest Ottawa, and many private industry founding members such as BlackBerry QNX, the Ottawa L5 network offers firms an integrated testing grounds for the safe implementation of CAVs (Invest Ottawa, 2020). The Ottawa L5 facilities include a private test track for testing CAV technologies and a public track that allows vehicle-to-everything (V2X) testing, validation and demonstration of technologies. In addition, the Ottawa L5 facilities provide an important testing grounds for smart infrastructure, 5G cellular technologies, drone technologies, big data, and cold-weather testing for new vehicle technologies.

In addition to Blackberry QNX and Ford's investments and the establishment of the Ottawa L5 test tracks, several multinational technology companies have announced recent investments into Ottawa's CAV ecosystem. For instance, Nokia recently announced that it will offer its expertise in high-speed data connections for vehicle connectivity functions such as data sharing and software upgrades (Nokia Canada, 2019). Similarly, Ericsson announced it will assist in developing V2X connectivity solutions for vehicles through its 5G digital cellular network capabilities (Invest Ottawa, 2019). Within the region, IBM is also developing software for its Watson platform, which serves as a core system for autonomous vehicles (Automotive News Canada, 2017).

Innovation in the region is supported by numerous government facilities, academic labs, partnerships and not-for-profit organizations. The National Research Council (NRC) of Canada operates eight automotive research facilities in the Ottawa region, including four different wind tunnels, through a partnership with the Automotive and Surface Transportation Research Centre. The region's universities and colleges provide additional research support and expertise in several automotive technology domains. The University of Ottawa's VIVA Lab, which was founded in 1999 within the School of Electrical Engineering and Computer Science, conducts research on autonomous driving and driver's assistance applications. In addition, Carleton University's Autonomous Vehicle Research Network brings together nearly 100 researchers from four faculties and 13 departments that are engaged in CAV-related research. In October 2020, a team of four students from Carleton University won the Automotive Parts Manufacturers' Association's (APMA) Project Arrow vehicle design competition. APMA's

Project Arrow initiative aims to build Canada's first full zero-emission concept vehicle. The program will run through 2022, culminating with the release of a concept car and a North American-wide tour. Lastly, organizations and partnerships such as the Centre of Excellence in Next Generation Networks (CENGN) drive innovation and growth in the region by bringing together talent and companies in various automotive technology fields.

## OTTAWA'S CLUSTER PROFILING AND OCCUPATIONAL ANALYSIS

Within the Greater Ottawa Area, a total of 44 organizations were found to be conducting activities related to the 10 automotive technology categories and trends under study. Those 44 organizations included: 37 automotive technology companies, three academic labs, two government facilities and two partnerships. Within the 44 companies and organizations, a total of 8,210 employees and individuals were identified<sup>2</sup>. This section details the distribution of technologies, occupations and skills in the Ottawa automotive technology cluster.

### Distribution of Companies and Organizations

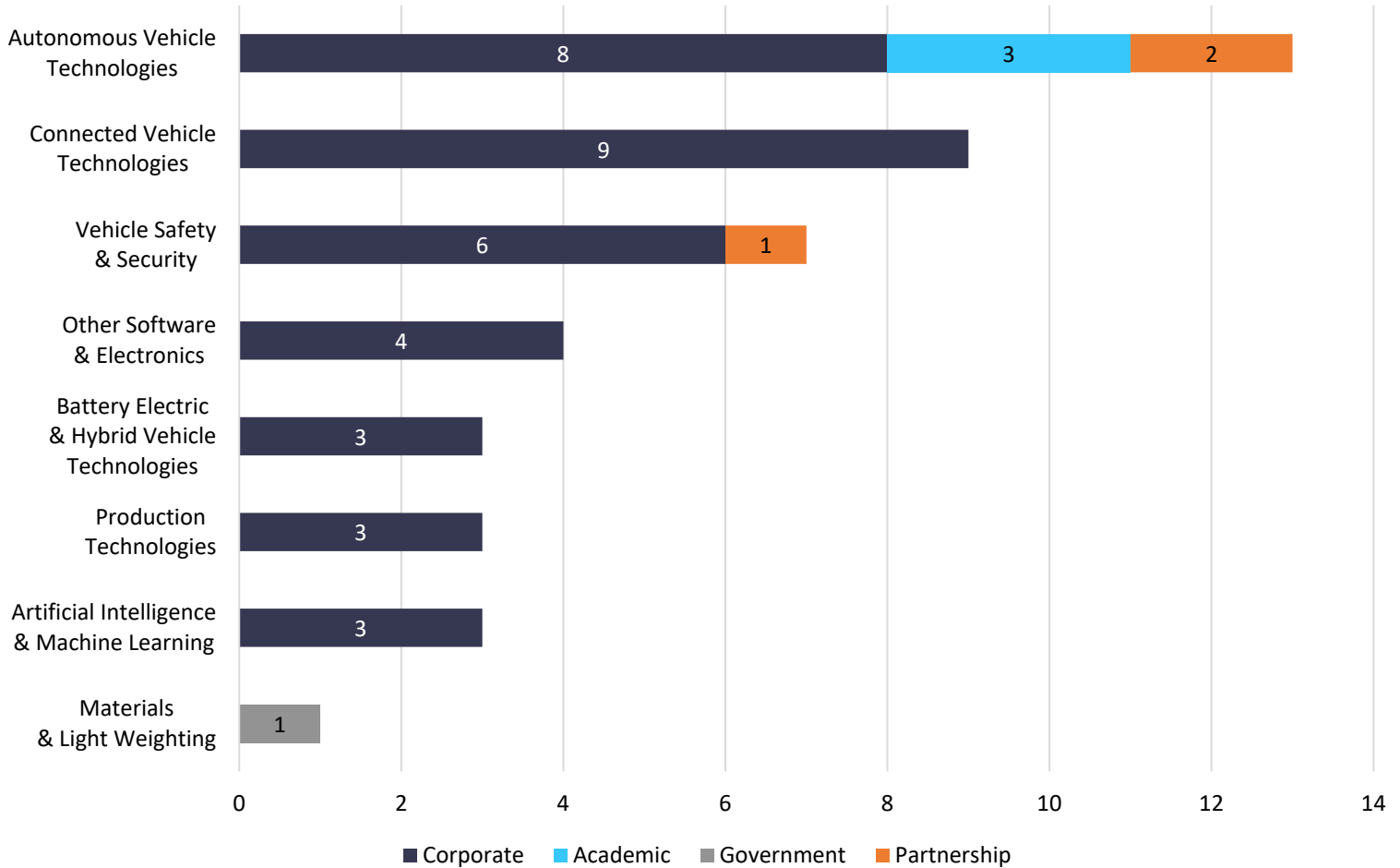
As presented in figure 1, three main technology specializations can be identified within the Ottawa cluster. They include (1) autonomous vehicle technologies, (2) connected vehicle technologies and (3) and vehicle safety & security. Under the autonomous vehicle technology category, we identified a total of 13 companies, labs and organizations in the Ottawa area. Of the eight companies that we identified, QNX Software Systems, IBM, and Aurigo Canada are several of the region's most prominent. QNX and IBM are active in software development for autonomous technology platforms. Aurigo Canada is developing and testing its autonomous four-seat pods and 12-seat shuttle vehicles at the L5 test track. Finally, NXP develops data collection sensors and electronics data collection for autonomous vehicles. The Ottawa region is also home to three academic labs which focus on autonomous hardware and software technologies, including the VIVA Lab at the University of Ottawa and the Autonomous Systems Group at Carleton University.

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<sup>2</sup> In this report, 'employees' refers to employees of private companies, as well as professors, researchers and students working in university labs and other research partnerships.



**Figure 1. Distribution of automotive-related technology companies and organizations in the Ottawa area by technology**



Under the connected vehicle technologies category, we identified a total of nine companies that are developing connectivity hardware and software solutions. Those companies include multinational telecommunications firms such as Nokia and Ericsson which contribute networking capabilities and software platforms. They also include Ford, which was the only OEM in the region found to be conducting automotive R&D at its Connectivity and Innovation Centre. Other companies under the vehicle connectivity category that we identified include Flex Ltd., Solace, Ligado, Trend Micro and Evolved Vehicle Environments (EVE).

In the vehicle safety & security technologies category, we identified six companies and one partnership. The majority of the companies under the vehicle safety & security category are

diversified, serving the automotive sector, as well as other industries such as communications, healthcare, entertainment and defence. They include companies such as Iredto Canada Corporation, Core AVI and Amika Mobile.

Other notable technology companies present in the cluster include Sidense and Crank Software under the other software & electronics category, GBatteries and GaN Systems under the battery electric and hybrid vehicle technologies category, and Raven AI under the production technologies category.

## Distribution of Employment and Skills

Examination of the distribution of employees and individuals in the Greater Ottawa Area revealed two main features. First, the majority of the region's employment (over 80%) is found in the CAV technology category. Second, compared to the CAV segments found in other Canadian automotive technology clusters, the region is home to more medium and large enterprises.<sup>3</sup>

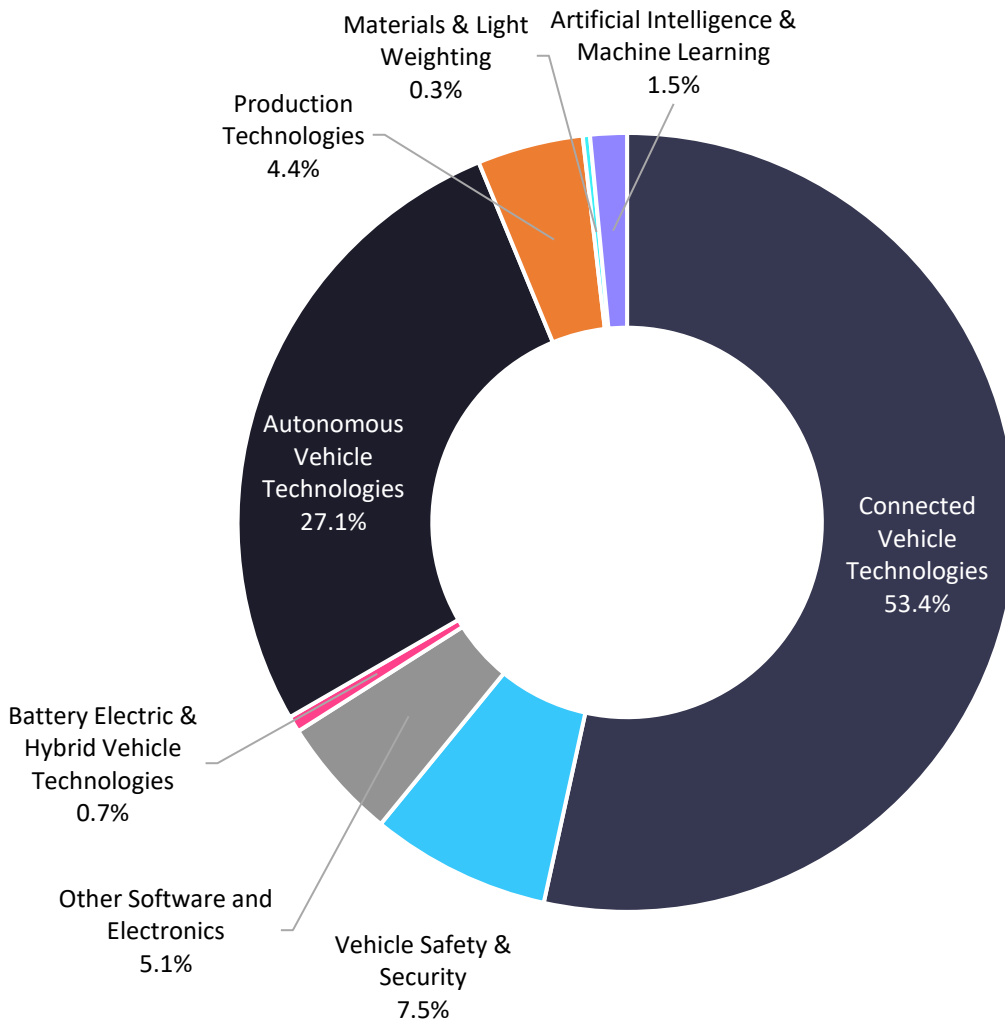
As presented in figure 2, the connected vehicle technologies category accounts for 53.4% of the total automotive technology employment in the Ottawa cluster. Under this technology category, Nokia and Ericsson account for the majority of employment with more than 2,200 and 1,100 employees respectively.<sup>4</sup> In addition to those companies, Ford's Connectivity and Innovation Centre in Kanata contributes close to 500 engineers and experts developing new cellular antenna technologies. Other companies - such as Solace, Flex Ltd., Ligado, Analog Devices and several others - collectively contribute more than 350 employees in the region.

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<sup>3</sup> Medium-sized enterprises are considered to employ between 250 - 499 employees, whereas large-sized enterprises are considered to employ more than 500 employees.

<sup>4</sup> For the purposes of this report, we assume that all of Nokia and Ericsson's software engineers and developers are equipped with the relevant skills and talent to assist with automotive projects and R&D.

**Figure 2. Distribution of employees and individuals (by percentage) associated with automotive activities by technology in the Ottawa cluster**

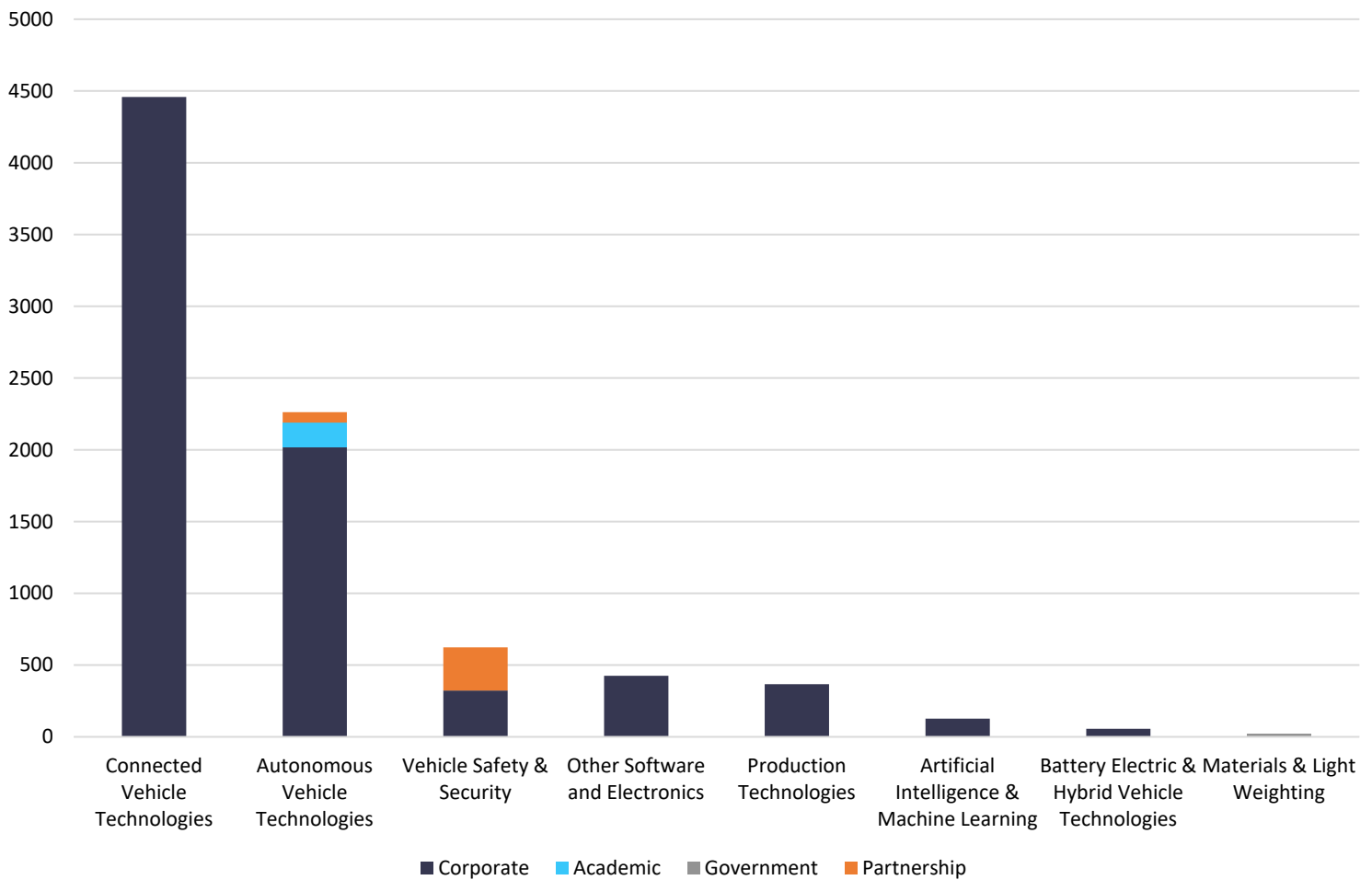


The autonomous vehicle technologies category accounted for 27.1% of the region’s total automotive technology employment. The majority of the employees under this category are employed by QNX Software Systems and IBM. Currently, QNX employs more than 400 software designers and developers, while IBM has more than 1,500 employees in its Ottawa offices. Additional employment related to the development of autonomous vehicle technologies in the region is provided by the Autonomous Systems Group at Carleton

University and the VIVA Lab at the University of Ottawa (more than 160 researchers, professors, researchers, students and lab technicians).

Other technology categories that provide significant employment in the region include the vehicle safety and security category, which provides a total of 623 employees and researchers (7.5% of total). The other software & electronics and production technologies categories account for 5.1% and 4.4% of the region’s total automotive technology employment.

**Figure 3. Distribution of employees and individuals associated with automotive activities by technology in the Ottawa cluster**



## Occupational Distribution

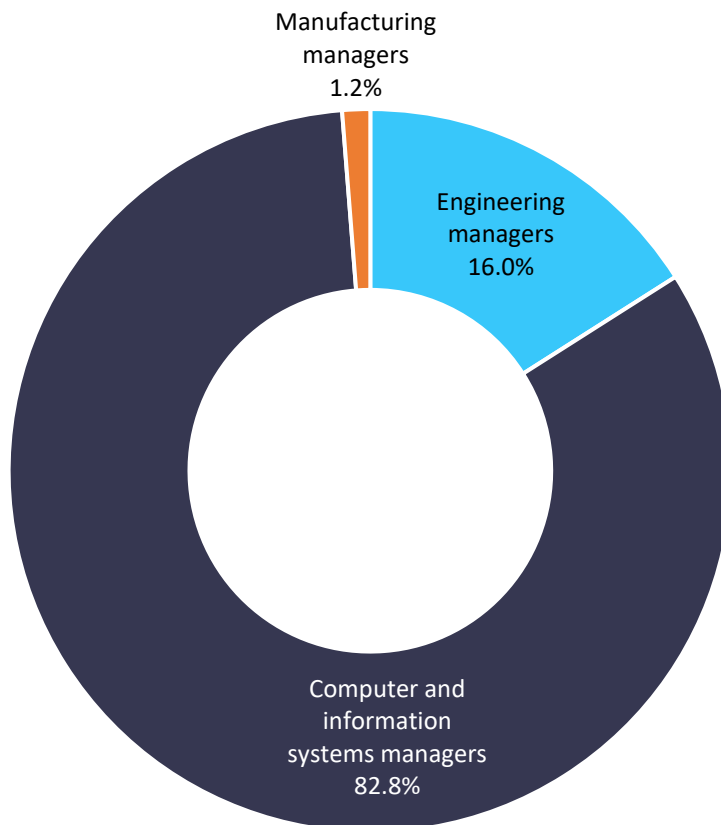
In the occupational distribution analysis, we reviewed a total of 1,815 profiles out of the cluster’s total 7,777 employees and 36 automotive technology companies. Of those 1,815 profiles, we found a total of 878 profiles that were relevant to the 18 highly skilled

occupations selected for this study. Our analysis showed a strong presence of talent and skills in the software and computer engineering and development streams. In this section, we review the distribution of occupations in three categories: management, engineering, and engineering technicians and technologists.

### Management Occupations

Among the three management occupations selected for analysis, 82.8% of the surveyed management profiles fell under the “Computer and information systems managers” occupations (figure 4). “Engineering managers” accounted for just 16% of the total management profiles, whereas “Manufacturing managers” comprised the remaining 1.2%. That distribution of employment broadly corresponds with the nature of operations in the 36 automotive technology companies that we identified in our region. As we previously identified, the majority of the operations at those companies are devoted to the development of CAV technologies and fall under the software engineering and computer programming streams.

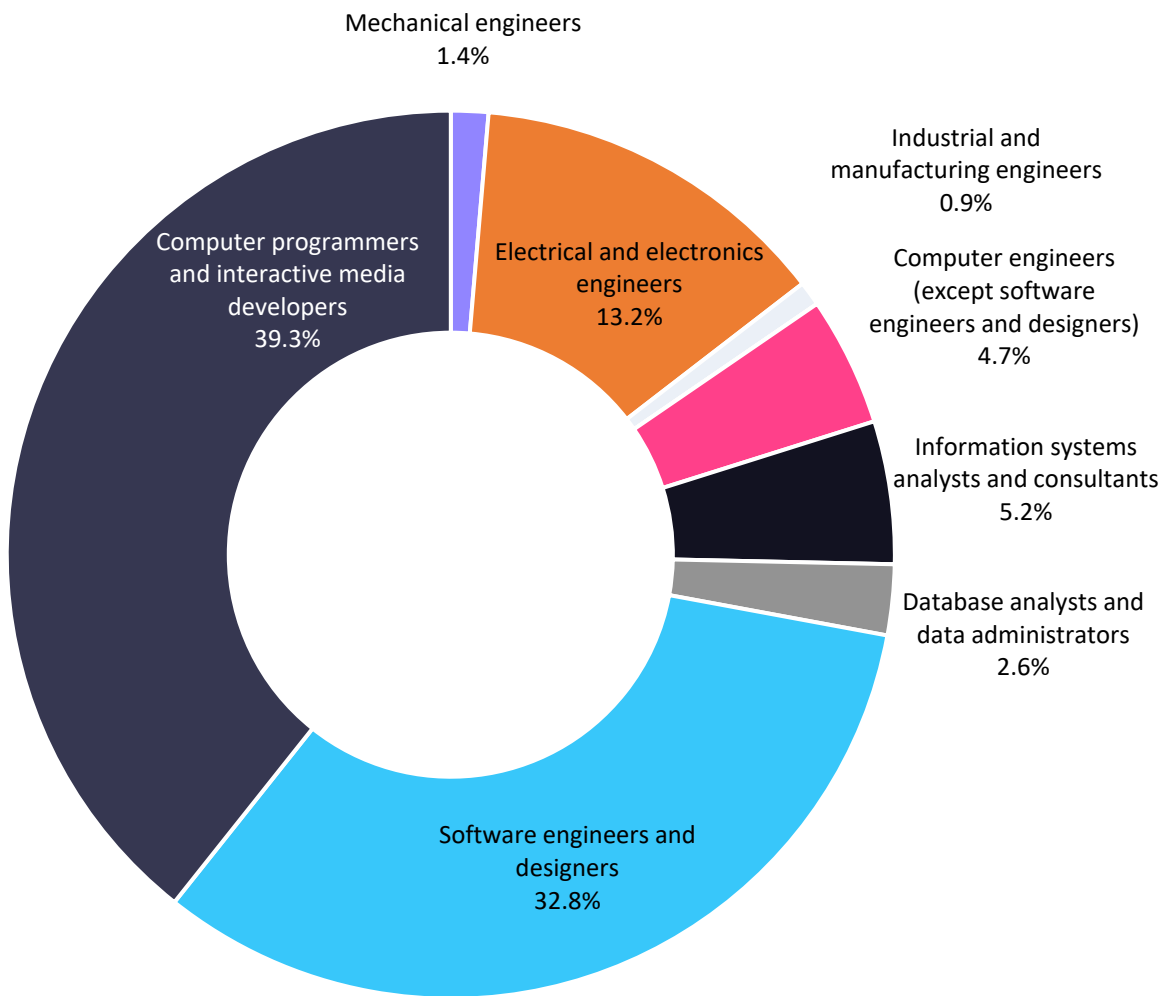
**Figure 4. Occupational distribution for management occupations in the automotive technology companies of Ottawa**



## Engineering Occupations

The distribution of engineering occupations in Ottawa's 36 automotive technology companies reflects a similar trend in the management occupations (figure 5). The majority of the engineering occupations fall under two main groups: "Computer programmers and interactive media developers" (39%) and "Software engineers and designers" (33%). In fact, when combined, all software and computer-related occupations account for 84.5% of the total engineering occupations in Ottawa's automotive technology companies. Once again, this trend highlights the importance of software engineering and computer programming skills in Ottawa's automotive technology cluster, especially for the development of CAV solutions. Other important engineering occupations include "Electrical and Electronics Engineers" which account for 13.2% of the total engineering occupations. "Electrical and Electronics Engineers" are typically responsible for designing electric circuits and printed circuit boards for vehicle connectivity, autonomy, and other engineering technology applications.

**Figure 5. Occupational distribution for engineering occupations in the automotive technology companies of Ottawa**

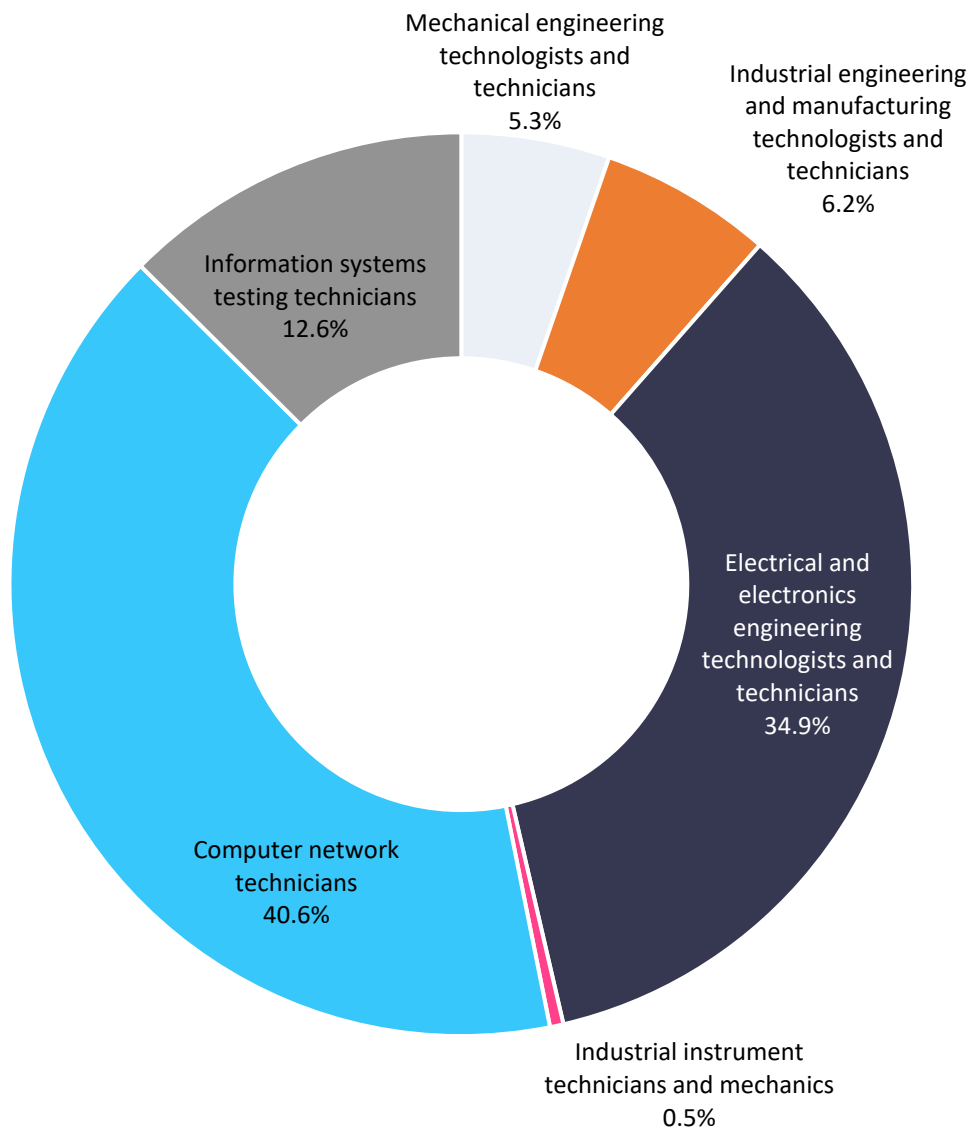


### Engineering Technologists and Technicians Occupations

Under the engineering technologists and technicians category (see figure 6), two occupations account for the majority of employment: “Computer network technicians” (40.6%), and “Electrical and electronics engineering technologists and technicians” (34.9%). “Computer network technicians” can be primarily found in telecommunications and connectivity companies. “Electrical and electronics engineering technologists and technicians”, on the other hand, typically can be found in automotive electronics manufacturing companies where

they are responsible for developing and testing electronic boards and modules for CAVs. Other occupations under this category include “Information systems testing technicians” (12.6%) , “Industrial engineering and manufacturing technologists and technicians” (6.2%) and “Mechanical engineering technologists and technicians” (5.3%).

**Figure 6. Occupational distribution for engineering technologist and technician occupations in the automotive technology companies of Ottawa**





## HIGHLIGHTS AND CONCLUDING REMARKS ON THE OTTAWA CLUSTER

With its strong presence of automotive technology organizations, skilled labour and talent, Ottawa has recently emerged as an important Canadian automotive technology hub. We observed that the Ottawa cluster specializes in the testing, design and development of CAV technologies and solutions. Notable factors influencing the cluster's specialization are Blackberry QNX presence and Ford's investment into its Connectivity and Innovation Centre. Moreover, the development of the L5 test tracks in the region has served to attract investment from several large multinational tech companies such as Nokia and Ericsson.

CAV development in the Ottawa automotive technology cluster is enhanced by the numerous government facilities, academic labs, partnerships and not-for-profit organizations in the region. In addition, the University of Ottawa, Carleton University, NRC's Automotive and Surface Transportation Research Centre, and several other regional partnerships are important generators of skills and encourage automotive research activities related to CAV technologies.

The Ottawa region's specialization in CAV technologies was strongly reflected in the employment data. Indeed, more than 80% of the employees and associated individuals in the Ottawa automotive technology cluster fall under the CAV technology categories. It is therefore unsurprising that we observed that software engineers and developers represent a large proportion of the region's engineering professionals. Individuals with those software skills are dynamic and can be quickly repurposed to serve the development of automotive technologies, such as cybersecurity technologies and automotive hardware solutions necessary for vehicle connectivity.

In addition to software engineers and developers, our occupation distribution analysis demonstrated that the Ottawa region is home to a significant number of individuals with expertise in computer programming and systems networking. We observed that many of those individuals are developing vehicle connectivity and autonomy solutions. They are also employed by companies performing software-related operations in other technology fields such as vehicle safety and security, the development of new production technologies, artificial intelligence and machine learning.

In sum, Ottawa's automotive technology cluster is an important contributor to Canada's broader automotive technology ecosystem. With the strong presence of major telecommunications companies, automotive technology suppliers and software engineering and development skills, the Ottawa cluster is well-positioned to lead Canada's efforts in the development of CAV technologies and solutions.

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