# Data Science Visualization Specialist

Data visualization specialists make large and/or complex data more accessible, understandable and usable. They deliver data in a useful and appealing way to end users. This requires expertise at translating data and statistical outputs in ways that are useful for both subject matter experts and business users. The roles and responsibilities of a data visualization specialist may include:

- eliciting the needs from end users in terms of data visualizations and related features (e.g., interactivity);
- accessing and manipulating data from different sources, for example using flat files or Structured Query Language (SQL) queries;
- developing dashboards, infographics, and interactive visualisations using different software, including common business intelligence tools (e.g., PowerBI, Tableau, PowerPoint) and/or specialized libraries (e.g., D3.js, seaborn, plotly);
- understanding and applying best practices for design of data visualizations; and
- communicating best data visualization practices and tools among data science teams, to avoid common mistakes and make data visualizations more effective;
- manage, clean, abstract, and aggregate data alongside a range of analytical studies on that data;
- manipulate and link different data sets;
- utilize storytelling techniques to communicate analysis results and impact.

## Behavioural Competencies

### Communication

Listening to others and communicating in an effective manner that fosters open communication.

#### Why this competency matters

Data Science Visualization Specialists must use active listening skills to ensure they clearly understand both explicit and implicit messages from team members. They must be able to adapt their communication style to the widely varying needs of many groups - management, project teams, technical staff, and clients. They also need to produce clear documentation related to methods and equations used.

| Foundation | Intermediate | Advanced |
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| 2 | 3 | 4 |
| ● Listens actively to ensure messages are understood.<br>● Presents ideas and information in a clear and | ● Probes to discover underlying needs, interests, issues, and motivations.<br>● Adapts style, mode, and | ● Interprets complex and possibly contradictory information.<br>● Uses varied communication vehicles and opportunities |

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| concise manner.<br>● Produces documentation appropriate for the medium through which information is being presented. | tone based on client reactions and issues being addressed.<br>● Articulates linkages between evidence and recommended course of action. | to promote dialog and develop shared understanding and consensus.<br>● Writes documentation that conveys nuances to facilitate in-depth understanding of the topic.<br>● Makes a compelling case for all stages of a proposed initiative to senior decision makers.<br>● Conveys and justifies complex recommendations to senior management in clear and non-technical terms. |

## Teamwork

Working collaboratively with others to achieve common goals and positive results.

### Why this competency matters

Data Science Visualization Specialists need to continuously work with others while providing advice on the operationalization of models. They interact with internal and external clients and stakeholders as part of effective data-driven solution development. They must be prepared to use creativity and flexibility in addressing client needs. They must be able to work as part of a diverse team as different resources are often brought together to interact and develop options. When necessary, they must be able to take a leadership role, emphasizing team goals, helping to define the problem, and treating others with respect.

| Foundation | Intermediate | Advanced |
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| ● Works collaboratively with others towards a shared goal.<br>● Shares information, knowledge and resources with others<br>● Understands the purpose and goals of the team, as well as their own role. | ● Probes to discover underlying needs, interests, issues, and motivations.<br>● Adapts style, mode, and tone based on client reactions and issues being addressed.<br>● Articulates linkages between evidence and recommended course of action.<br>● Assumes leadership role when necessary<br>● Coaches, challenges, and helps others develop their skills.<br>● Motivates and supports others in team development and achievement of mandate goals<br>● Develops and implements plans to ensure the team has the resources to meet its goals. | |

## Ethics and privacy

Ensuring access, quality, and security while cleaning, processing, and transforming data for analytics to ensure access to accurate, reliable and high value information in support of data science and machine learning operations.

### Why this competency matters

Data Science Visualization Specialists must understand the ethical basis of managing large data sets with private information in them, and be able to describe the advantages and disadvantages of the use of record level data to achieve business outcomes. They discuss ethical concerns with stakeholders and, when necessary, seek out and use appropriate disclosure procedures. They take a balanced approach to managing risk by implementing appropriate privacy and security measures, and share evidence, research and decision making openly. They have knowledge of the responsible use of AI. They comply with ethical guidelines in the design and use of systems which automate decision making. Data Science Visualization Specialists need to understand data relevancy to be able to assess biases in algorithms and ensure their outcomes are fair to everyone.

| Foundation | Intermediate | Advanced |
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| ● Understands ethical concerns arising from the use of historical data to train models.<br>● Applies ethical guidelines/regulations of the organization consistently.<br>● Able to identify and assess bias and ensure fair outcomes from analyses.<br>● Raises ethical concerns when necessary. | ● Able to assess the advantages and disadvantages of record level data, and their impact on analyses.<br>● Familiar with the ethical framework of the organization and uses appropriate disclosure procedures when necessary.<br>● Guides others in making complex ethical decisions. | |

## Analytical thinking

Understanding when data can be used to inform or to support, as well as the process of interpreting data into identifiable problems and research questions.

### Why this competency matters

Data Science Visualization Specialists must be able to both understand and respond to complex issues. They see the connections between problems and issues and manipulate that information in order to develop short- and long-term plans and recommendations for management, clients and other stakeholders. They are capable of adapting their thinking style, using cause and effect relationships to analyze problems in a step-by-step way, interpreting information and developing recommendations. They systematically organize and

compare various aspects of a problem or situation and determine cause and effect relationships in order to resolve problems in a sound, logical and decisive manner.

| Foundation | Intermediate | Advanced |
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| ● Ask the right questions to identify relevant problems/issues.<br>● Recognize connections and develop short-term plans and recommendations.<br>● Use cause and effect relationships to analyze problems systematically.<br>● Resolve problems in a sound, logical and decisive manner. | ● Understand and respond to complex analytical issues.<br>● Develop short- and long-term plans and recommendations.<br>● Use cause and effect relationships to analyze problems, interpret information and develop recommendations. | ● See connections between problems and issues to develop short- and long-term recommendations for management, clients, and stakeholders.<br>● Systematically organize and compare various aspects to resolve problems.<br>● Resolve problems in a sound, logical and decisive manner. |

## Promote innovation and guide change

Actively encourages exploration of data to solve business problems through bold thinking, experimentation and intelligent risk taking. Willing to entertain the possibility of failure, and learns from it to improve future undertakings.

### Why this competency matters

Data Science Visualization Specialists have the courage and resilience to challenge convention. They seek opportunities for innovation and propose creative practices, concepts or products. They adjust practices to address lessons learned following setbacks and mistakes, and implement plans that respond to changes in direction and priorities. They demonstrate resilience, composure and a positive outlook in an environment of uncertainty and ambiguity.

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| N/A | ● Responds constructively to ambiguity and uncertainty; contributes ideas for improvements.<br>● Analyzes information before seeking assistance.<br>● Takes initiative to seek solutions to problems identified.<br>● Demonstrates a positive attitude to change and a willingness to try new | ● Recognize connections and develop short-term plans and recommendations.<br>● Use cause and effect relationships to analyze problems systematically.<br>● Resolve problems in a sound, logical and decisive manner. |

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| | approaches. | |

### Achieving results

Mobilize and manage resources to deliver on the priorities of the Government, improve outcomes and add value. Consider the context, risks and business intelligence to support high-quality and timely decisions.

#### Why this competency matters

Data Science Visualization Specialists coordinate and prioritize work activities to contribute to organizational objectives and results. They increasingly play a key role in defining measurable KPIs for projects and programs. They follow through on operational plans and revise them when priorities or conditions change. They inform decision-making with sound understanding of context, data and evidence. They take ownership and acknowledge the impact and outcome of their decisions.

| Foundation | Intermediate | Advanced |
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| ● Accomplishes own share of work.<br>. | ● Responds to changes in organizational priority, revising own work when conditions change.<br>● Plans for contingencies to deal with unforeseen events or setbacks.<br>● Breaks activities into smaller components to facilitate completion. | ● Evaluates project plans to ensure that goals are reached.<br>● Contributes to annual plans for the work unit considering a range of factors in the planning process. |

## Technical Competencies

### Storytelling

Conveying results of work coherently and understandably through data visualization to present phenomena from a new perspective, using different approaches to build narratives in order for stakeholders to identify the best course of action.

#### Why this competency matters

Data Science Visualization Specialists must be able to translate data science outputs into an appropriate visual design, defining the context of the story. They leverage best practices in visual design to streamline and ensure story clarity while demonstrating the scientific basis for the analysis.

| Foundation | Intermediate | Advanced |
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| ● Assesses audience needs, familiarity with data and understanding of subject matter.<br>● Ensures data presentations link directly to original questions and/or line of thinking. | ● Considers intended use of material to ensure fit-for-purpose.<br>● Presents new questions by uncovering patterns and drawing insights from data.<br>● Uses various storytelling techniques to provide advice to the business area. | ● Makes effective use of archetypes.<br>● Employs multiple storytelling techniques based on medium and intended audience.<br>● Reflects strategic thinking in stories, helping to envision long term impacts. |

## Data Visualization

Possess the skills to create graphical representation of the information derived from machine learning outputs.

### Why this competency matters

Data Science Visualization Specialists must be able to prepare data sets for visualization in a format best suited to the communication medium. They are able to communicate complex concepts by applying the adequate visualization technique to the data or analytical output at hand. They are able to simplify complex theories and data through visualization by focusing on key areas. When required, they are able to create interactive visuals to aid in understanding of large datasets. Data Science Visualization Specialists must also be able to create accessible visualizations as outlined in the GC Digital Standards.

| Foundation | Intermediate | Advanced |
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| ● Basic understanding of the most appropriate visualization technique for various data types.<br>● Ability to share results through dashboards or applications.<br>● Ability to apply best practices and techniques when creating data visualizations.<br>● Evaluates graphical representations of data for accuracy or misrepresentation.<br>● Includes correct and relevant references, | ● Demonstrate ability to create appropriate visualization to present complex patterns in a dataset.<br>● Understands and applies principles of effective visualization analysis and design (through approriate marks, channels, data abstraction, etc).<br>● Ability to present and interpret data visualization concisely to management or business stakeholders. | ● Designing automated dashboards and data mining presentations.<br>● Incorporate graphical representations into existing products for deeper analysis.<br>● Ability to produce interactive visualizations and combine different techniques to to effectively depict complex information. |

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| labels and citations.<br>● Demonstrate ability to create appropriate visualization to present patterns in a dataset.<br>● Ability to present and interpret data visualization concisely to management or business stakeholders. | ● Provides drill down capability in reports and summary information to allow further investigation<br>● Able to work with clients to provide the most appropriate visualization techniques to deliver the expected value. | |

## Programming

Knowledge and ability to design, define, construct, enhance, support, and maintain software associated with machine learning.

### Why this competency matters

Data Science Visualization Specialists must be able to use version control platforms to assist with collaboration. They consider privacy, accessibility, usability and interoperability. They must have knowledge of both commercial and open source software packages and solutions related to data science. They have knowledge of software construction, testing, configuration, deployment infrastructure and the range of system development methodologies and operating standards.

Data Science Visualization Specialists must be able to programmatically manage and process data using common (generally open source) data science tools and languages. They understand the differences between sorts of data structures (e.g. vectors, matrices, arrays, factors, lists and data frames). They know how to efficiently extract data using queries in relational databases. They are able to produce dynamic, interactive visualizations in web browsers based on the outputs of data science processes.

| Foundation | Intermediate | Advanced |
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| ● Demonstrate ability to write efficient and maintainable code.<br>● Write a program to parse data and generate visualizations through common libraries and software.<br>● Ability to write program to retrieve data from cloud or through APIs. | ● Ability to develop reusable code artifacts that can be called.<br>● Ability to adapt or combine common libraries and software to meet specific requirements of advanced visualizations.<br>● Demonstrate ability to create and deliver visualizations associated with ML solutions. | ● Ability to visualize and design complex systems with multiple product lines and integrations with internal systems.<br>● Ability to go beyond common libraries and packages and programmatically create custom, interactive visualizations for web and mobile. |

## Mathematics and Statistics

Knowledge in a range of mathematical and statistical techniques, to understand and be able to apply them, and to know their underlying assumptions and limitations.

### Why this competency matters

Data Science Visualization Specialists must have an understanding of algebra and probability theories and techniques that will be applied at multiple stages of data science work. They must be able to carry out operations on matrices, study the basic properties of functions and relations, and to indicate classes of equivalence relations. They understand the theoretical basis of analysis of variance, can describe the assumptions underlying statistical techniques, and understand the consequences of the assumptions not holding. They are able to depict the expected output of factor analysis, and effectively and accurately interpret statistical output. They can compare selected statistical methods and specify differences between them, selecting the most relevant statistical method for a specific analytical problem.

| Foundation | Intermediate | Advanced |
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| ● Demonstrate knowledge in a range of mathematical and statistical techniques<br>● Apply mathematical and statistical processes appropriate to a given situation | ● Demonstrate ability to perform exploratory data analysis and identify important relationships between variables.<br>● Apply statistical techniques to extract valuable dataset from noise.<br>● Understands the pros and cons of various statistical tests and when they should be applied.<br>● Possess knowledge of several statistical concepts, including statistical significance, regression, and hypothesis testing.<br>● Apply rigorous statistical techniques to extract valuable dataset from noise.<br>● Implement and demonstrate a mathematical and statistical strategy to solve complex problems. | |

## Project management

Knowledge and ability to apply agile project management principles and practices during the planning, implementation, monitoring, and completion of projects, ensuring effective management of scope, resources, time, cost, quality, risk, and communications.

### Why this competency matters

Data Science Visualization Specialists need to understand the different project management approaches applicable to data and digital projects, including agile methodologies and project reporting. They apply formal project management principles and practices during the planning, implementation, monitoring and completion of projects. They identify issues and escalate appropriately to minimize project impacts. They participate in the development of project plans (e.g., project charters, work breakdown structure, estimates, change management plans, communication plans). They are also comfortable working on projects of

different size, from proofs of concept to large and constantly evolving projects, through iterative development. They are able to independently manage small projects or components of larger projects, working closely with other team members to deliver work in small increments.

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| ● Knowledge of fundamental project management processes, methodologies, tools and techniques.<br>● Ability to translate organization vision into a project vision<br>● Able to promote effective communication of projects.<br>● Able to plan, organize, assess and monitor management of projects.<br>● Able to identify key issues and pick the best course of action.<br>● Able to make timely decisions and take action reflective of the department's objectives.<br>● Able to plan, organize, assess and monitor management of projects, in conjunction with project managers and stakeholders. | | ● Able to influence decisions that need to be made in order to make the project successful.<br>● Able to identify interdependencies between various projects. |

## Business acumen

Understanding and dealing with the risks and opportunities that will likely lead to a positive outcome. Effectively communicating ideas to management, clients, and the public.

### Why this competency matters

Data Science Visualization Specialists are able to deal with large amounts of knowledge and translate it effectively for a non-technical audience. They maintain a working knowledge of current and upcoming trends, and are able to acquire the foundations of relevant disciplines, concepts, and tools. Their knowledge and analytical skills of business objectives provide answers to current problems, and are able to propose actionable insights that can improve product quality. They work with the client to fully understand their needs, and regularly report on progress for feedback. They are able to understand the need to adapt the production process to the expected product and functionality.

| Foundation | Intermediate | Advanced |
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| ● Demonstrates basic understanding of the organizational structure, mandate, strategies and challenges.<br>● Demonstrates general understanding of organizational policies, | ● Uses the organization's formal and informal channels to accomplish work.<br>● Applies analytical knowledge and skills to address current problems.<br>● Leverages client's priorities and objectives to enable required actions and make recommendations.<br>● Seeks perspectives from clients to accomplish work.<br>● Leverages client's priorities and objectives to enable required | |

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| processes and systems relevant to the work. | actions and make recommendations.<br>● Anticipates potential policies, issues and trends that may have an impact.<br>● Positions recommendations based on an understanding of the organization and its relationships with stakeholders. |

## Data Management

Ensuring access, quality, and security while cleaning, processing, and transforming data for analytics to ensure access to accurate, reliable and high value information in support of data science and machine learning operations.

### Why this competency matters

Data Science Visualization Specialists must be able to demonstrate working level knowledge of DBMS applications and data lakes. They are able to query and process data from structured and unstructured sources, move data between cloud and on-premise environments, and implement data integrity safeguards. They assess data sources for quality, suitability and performance requirements. They must also be able to use diagnostic and monitoring tools to prevent problems, enhance performance and availability.

| Foundation | Intermediate | Advanced |
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| 1 | 2 | 2 |
| ● Able to create new relational (SQL) and non-relational (NoSQL) databases.<br>● Able to demonstrate relationships in database through constructed queries | ● Make effective use of relational databases and data lakes to address operational needs.<br>● Query and process data from both structured and unstructured sources.<br>● Move data between cloud and on-premise environments while maintaining appropriate safeguards.<br>● Leverage diagnostic and monitoring tools to resolve problems.<br>● Makes proficient use of relational (SQL) databases and non-relational (NoSQL) databases. | |

## Machine Learning

Possess a combination of knowledge and skills in developing self-learning algorithms, including the application of open source machine learning algorithms and libraries.

### Why this competency matters

Data Science Visualization Specialists must be able to understand different types of machine learning techniques (supervised, unsupervised, semi-supervised). They must be able to appropriately interpret the model evaluation (quality) indicators (e.g. accuracy, recall, F1 score). They must understand how data is represented within different machine learning models in order to effectively represent the information when producing visuals.

| Foundation | Intermediate | Advanced |
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| ● Appropriately uses predictive modelling, time series/forecasting, clustering, principal component analysis and other techniques.<br>● Uses advanced tools and techniques to perform data exploration. | ● Understanding “how” and “which” machine learning techniques is appropriate to solve business problems.<br>● Ability to apply machine learning algorithms as defined in libraries to build and train AI solutions.<br>● Demonstrate ability to evaluate machine learning models while putting into consideration intrinsic bias from the dataset and the model.<br>● Explains results obtained to stakeholders. | ● In-depth understanding of machine learning techniques and their application to solving business problems.<br>● Develop and implement machine learning algorithms for use in building and training AI solutions.<br>● Application of a broad range of machine learning techniques to solve wide ranges of real-life problems.<br>● Possess knowledge about recent advances in application of machine learning techniques.<br>● Dive deeper in presenting evaluation results from machine learning models. |