



# Data Analytics Day at ESDC

Data Exploration and  
Data Visualization

Learning Map



## Overview

### Data Visualization Concepts and Notions (AM session)

While data visualizations are often used for reporting, they can also be used to explore data and to set the stage for in-depth analysis, or for insight extraction. In this module, participants will:

- become aware of the different roles of data visualization in the data analysis process;
- increase their understanding of how to represent simultaneously multiple dimensions;
- be introduced to some of the strategies and considerations used to create good post-analysis visualizations;
- be made aware of the difference between a visualization and an infographic;
- improve their judgment about the quality of data visualizations;
- study the fundamental principles of analytical design;
- study the grammar of graphics, and
- be introduced to the basics of dashboards

### Data Visualization for Reporting with Power BI (PM session)

Poorly designed visualizations (graphs, reports, charts, slides etc.) can lead to confusion and, in the worst case, erroneous business decisions. End users are constantly seeking the best ways to understand the data behind the data. The most effective way to help them is by making it visual. This module is aimed at taking participants through the basics of creating dashboards and interactive reports with Power BI. In this module, participants will

- learn how Power BI fits into a larger software framework, and when, and when not, to use it;
- witness a Power BI walkthrough;
- get a head start on data modeling;
- learn how to build basic visualizations and dashboards in Power BI, and
- learn how to publish dashboards and reports to end users.

## Presentation Topics

- Data Exploration
- Pre-Analysis Data Visualization
- Post-Analysis Data Visualization
- Visualization Catalogue
- Hall-of-Fame / Hall-of-Shame
- The Grammar of Graphics
- Introduction to Dashboards
- Power BI and Dashboards

## Reading and Viewing List

### Warm Up

- **Video:** The Art of Data Visualization | Off Book | PBS Digital Studios
  - <https://www.youtube.com/watch?v=AdSZJzb-aX8>
- **Video:** The beauty of data visualization - David McCandless
  - <https://www.youtube.com/watch?v=5Zg-C8AAlGg>

### Getting Going

- **Article:** One Dataset, Visualized 25 Ways
  - <https://flowingdata.com/2017/01/24/one-dataset-visualized-25-ways/>
- **Video:** Data Analysis 2: Data Visualisation - Computerphile
  - <https://www.youtube.com/watch?v=j6CIFJhnG18>
- **Video:** The best stats you've ever seen
  - [https://www.ted.com/talks/hans\\_rosling\\_shows\\_the\\_best\\_stats\\_you\\_ve\\_ever\\_seen](https://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen)
- **Video:** How a blind astronomer found a way to hear the stars | Wanda Diaz Merced
  - <https://www.youtube.com/watch?v=-hY9QSdaReY>
- **Article:** Turning hurricanes into music
  - <https://earthsky.org/earth/turning-hurricanes-storms-into-music-sonification>
- **Video:** Sonification of Storms Year 2005 - Mark Ballora
  - <https://www.youtube.com/watch?v=TKTLE1rRUDA&feature=youtu.be>
- **Notes:** A ggplot2 Primer
  - [www.data-action-lab.com/wp-content/uploads/2018/11/DSRS\\_GGP2.pdf](http://www.data-action-lab.com/wp-content/uploads/2018/11/DSRS_GGP2.pdf)
  - <https://www.data-action-lab.com/wp-content/uploads/2019/12/ggplot2-Visualizations.html>
- **Notes:** Dashboards and Data Visualization, with Examples
  - <https://www.data-action-lab.com/2019/09/16/dashboards-and-data-visualization-with-examples/>
- **Video Tutorial:** Power BI Tutorial for Beginners - Basics and Beyond (~45 minutes)
  - <https://www.youtube.com/watch?v=AuYzsfXKkbM>

### Final Push

- **Article:** Perception in Visualization
  - <https://www.csc2.ncsu.edu/faculty/healey/PP/>
- **Article:** Ask the question, Visualize the answer
  - <https://flowingdata.com/2018/10/17/ask-the-question-visualize-the-answer/>

- **Article:** The death of interactive infographics?
  - <https://medium.com/@dominikus/the-end-of-interactive-visualizations-52c585dcafcfb#.ya4dn1mzh>
- **Article:** Error bars in bar charts. You probably shouldn't
  - <https://gorelik.net/2019/10/07/error-bars-in-bar-charts-you-probably-shouldnt/>
- **Article:** A Big Article About Wee Things
  - <https://www.propublica.org/nerds/a-big-article-about-wee-things>
- **Article:** 50 Great Examples of Data Visualization
  - <https://www.webdesignerdepot.com/2009/06/50-great-examples-of-data-visualization/>
- **Tutorial:** Learn Shiny (straight from the horse's mouth...)
  - <https://shiny.rstudio.com/tutorial/>
- **Tutorial:** The Complete ggplot2 Tutorial – Part 1 | Introduction To ggplot2 (Full R code)
  - <http://r-statistics.co/Complete-Ggplot2-Tutorial-Part1-With-R-Code.html>
- **Tutorial:** The Complete ggplot2 Tutorial – Part 2 | How To Customize ggplot2 (Full R code)
  - <http://r-statistics.co/Complete-Ggplot2-Tutorial-Part2-Customizing-Theme-With-R-Code.html>
- **Tutorial:** Top 50 ggplot2 Visualizations – The Master List (With Full R Code)
  - <http://r-statistics.co/Top50-Ggplot2-Visualizations-MasterList-R-Code.html>
- **Tutorial:** Official seaborn tutorial
  - <https://seaborn.pydata.org/tutorial.html>

### Bonus

- **Video:** How a Fitness App's Heat Map Uncovers Military Bases | NYT
  - <https://www.youtube.com/watch?v=0IB8p-YpXwA>
- **Article:** Our solar system sounds like a depressed Radiohead cover band
  - <https://theoutline.com/post/3573/radiohead-true-love-waits-solar-system?zd=1&zi=uzp7waba>
- **Article:** Data Visualization: Visualization Types
  - [https://guides.library.duke.edu/datavis/vis\\_types](https://guides.library.duke.edu/datavis/vis_types)

### Additional References

- [Understanding Graphics](#)
- Krygier, J., Wood, D., [2016], [Making Maps: A Visual Guide to Map Design for GIS](#), Guilford Press
- [Interactive Data Visualization](#) on Wikipedia
- [Is animation an effective tool for data visualization?](#), NASA
- [Perception in Visualization](#), C.G. Healey (very cool!)
- [Data Physicalizations](#)
- Tufte, E. [2001], The Visual Display of Quantitative Information, Graphics Press.



- Hu, D. [1954], How to Lie With Statistics, Norton
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- Nussbaumer Knaflic, C. [2015], Storytelling with Data, Wiley
- Cairo, A. [2013], The Functional Art, New Riders
- Cairo, A. [2016], The Truthful Art, New Riders
- Meireilles, I. [2013], Design for Information, Rockport
- 50 Great Examples of Data Visualization: <http://www.webdesignerdepot.com>
- [Visualising Data](#)
- Nathan Yau's [FlowingData](#)
- [Data Visualization](#) on Wikipedia
- [Misleading Graphs](#) on Wikipedia
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- Miller, M. [2017], [The problem with Interactive graphics](#), Co.Design
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- Kabacoff, R.I. [2011], R in Action, Second Edition: Data analysis and graphics with R, Live.
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- Broman, K. [2016], Data Visualization with ggplot2.
- Robinson, D., Visualizing Data Using ggplot2, on [varianceexplained.org](http://varianceexplained.org).
- Manipulating, analyzing and exporting data with tidyverse, on [datacarpentry.org](http://datacarpentry.org).
- Wickham, H. [2014], Tidy Data, Journal of Statistical Software, v59, n10.

## Exercises and Discussion Questions

What is one example of data presentation, provided in the reading and viewing material, that you found particularly insightful or powerful?

What is one example of data presentation, provided in the reading and viewing material, that you found misleading?

How do you think new technologies (e.g. virtual or augmented reality, 3D-printing, wearable computing) will influence data presentation?

## DAL Founders / Lead Instructors



**Jennifer Schellinck** is passionate about bringing cutting-edge data technology to organizations wanting to develop the best analysis and decisions. She applies the latest machine-learning and systems-modelling techniques to help organizations achieve their greater potential.

Jennifer's machine learning and simulation expertise comes from her background in Cognitive Science, earning a Ph.D. in 2009. As an Adjunct Professor at Carleton University, she remains active in academia and keeps up-to-date on current research. She has been offering data-based workshops since 2015.

She founded **Sysabee** in 2012 and is the founding member of the **Data Science Experts Group**, an association of specialists who customize data-driven solutions for each client.



**Patrick Boily** is interested in the application of mathematics/statistics to evidence-based decision support. He has worked on 25+ such projects since 2008, first as a public servant, then as a quantitative consultant for Carleton University, and later through his company **Idlewyld Analytics and Consulting Services**.

Patrick is bilingual and has taught over 40 university courses in mathematics, statistics, data analysis, machine learning, and quantitative consulting. He has been leading workshops and training on data analysis/machine learning since 2015.

He has extensive experience in data science, machine learning, A.I. and predictive analytics, data cleaning, data visualization, queueing systems, stochastic modelling, and simulations – managing and being involved in numerous projects in these subject areas from inception to completion.



**Stephen Davies** is the CEO of **DAVHILL Group**, a business intelligence and data analytics company based in Ottawa, Ontario, specializing in the implementation of Business Intelligence, Artificial Intelligence, and Machine Learning Systems. At DAVHILL, Stephen's main focus is to make data real and useable for everybody.

Steven has more than 25 years of experience working in both public and private sectors. With an academic background in Physics and Engineering, he has worked in semiconductor and OEM manufacturing as an engineer and supply chain director.

Early in his career in operations management, he started to do data analysis and never quite escaped. As a Business Intelligence and Process Transformation consultant he is delighted to provide training courses to the Data Action Lab.





**DAL** instructors have consulted for (and taught to participants from) a variety of groups, a selection of which is shown below:

- Canada Revenue Agency
- Canada School of Public Service's Digital Academy
- Canadian Air Transport Security Authority
- Canadian Coast Guard
- Canadian Food Inspection Agency
- Canadian Institute for Health Information
- The Children's Hospital of Eastern Ontario
- Communications Research Centre Canada
- Department of National Defence
- Environment and Climate Change Canada
- Fisheries and Ocean Canada
- Health Canada
- Immigration, Refugees and Citizenship Canada
- Indigenous and Northern Affairs Canada
- Natural Resources Canada
- Nuclear Waste Management Organization
- Office of the Privacy Commissioner of Canada
- Privy Council Office
- Public Services and Procurement Canada
- Royal Canadian Mounted Police
- Transport Canada
- Treasury Board Secretariat

Consult our **Data Training Catalogues** for a list of practical data analysis and data leadership courses.

Visit [data-action-lab.com](https://data-action-lab.com) or contact [info@data-action-lab.com](mailto:info@data-action-lab.com) for more information.

