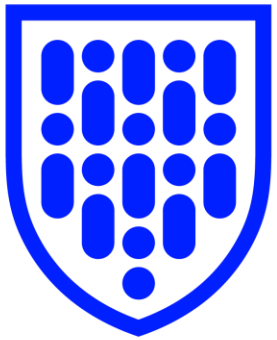

# Institute of Data

2019

# Data Science

Module X
Part 1:

## Critical Thinking

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# Agenda: Module X Part 1

- **What** is critical thinking?
- **Why** is it important for **Data Science**?
- What does critical thinking **involve**?
- What are the **elements** of critical thinking?
- How to undertake the **process** of critical thinking?
- Practice!

# What is critical thinking?

- The **objective analysis** and **evaluation** of an issue in order to form a **judgement**.
- It includes the **rational**, **sceptical**, **unbiased** analysis, or evaluation of factual evidence.
- It is **self-directed**, **self-disciplined**, **self-monitored**, and **self-corrective** thinking

# What does critical thinking involve

- **Open mindedness**
- **Reasoning**
- **Questioning** assumptions
- **Higher order** questions
- Investigating **evidence**
- **Communicating**
- Debating

# Why is critical thinking important for Data Science?

- Critical thinking is one of the most important skills of a Data Scientist because it enables you to:

  - Understand different stakeholders interests
  - Formulate appropriate questions to ask to engage and get buy-in
  - Uncover risks and threats
  - Identify simple solutions

# Elements of critical thinking

1. Assumptions: Must be identified
2. Arguments: Must be important and relevant.
3. Conclusions
   - Deductions: Conclusions that are ONLY drawn from facts.
   - Interpretation: Are the facts being used correctly to draw high quality conclusions
   - Inferences: Where you draw a conclusion that is not directly supported by facts, but instead it is supported by an assumption. Know the difference!

# Assumptions

When you make a statement that holds something to be true in the absence of proof then you are making an assumption. Assumptions can be either stated or remain unstated. By identifying these assumptions, you can reveal information gaps and develop perspective and insight into an issue. Aim to:

- Explicitly identify assumptions
- Seek out different views into a situation from multiple stakeholders
- Evaluate assumptions and how appropriate they are for the situation especially the risks if they are not true

# Evaluating Arguments

Arguments are made up of assertions which persuade someone to act in a certain way or believe something. When you analyse someone's argument you need to break down their assertions and analyse them objectively. To do this you must overcome confirmation bias and emotion. Then you can determine whether or not to believe an argument and how to respond. Aim to:

- Be objective, accurate and thorough, so as to consciously deal with emotion and confirmation bias
- Analyse the reasoning and evidence of an argument
- Consider counterarguments even though they may challenge people

# Drawing Conclusions

By using Deduction, Interpretation and Inference, you can make judgements about an issue, which is known as drawing a conclusion. Deductions are simple conclusions that are only drawn from facts. Interpretation is how well the facts being used to draw conclusions. An inference is a conclusion based on an assumption and not a fact, e.g. “These sheep are white, therefore all sheep are white.” Aim to:

- Gather all relevant information of a variety of quality
- Remain within the supporting evidence you have and justify when you go beyond it
- Respond appropriately based on compelling evidence

# A process for critical thinking

- **Question Assumptions!**
  - Identify assumptions
  - Start with a **question**
  - Dig deeper by **re-questioning**
  - Ask **why**
  - Make necessary **assumptions**
  - **Define** the problem
- **Research and Document Arguments!**
  - **Source** the data
  - **Analyse** the data
  - Research how **others** have investigated this question
  - Formulate a **plan** to answer the question
- **Present Conclusions!**
  - Make **Deductions**
  - Demonstrate your **Interpretations**
  - Be careful with **Inference**
  - Understand your **audience/ stakeholders**
  - Formulate a clear "**call for action**"
  - Distil the **message**
  - Engage **audience**

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# Questions?

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# Lab X.1.1

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# End of presentation