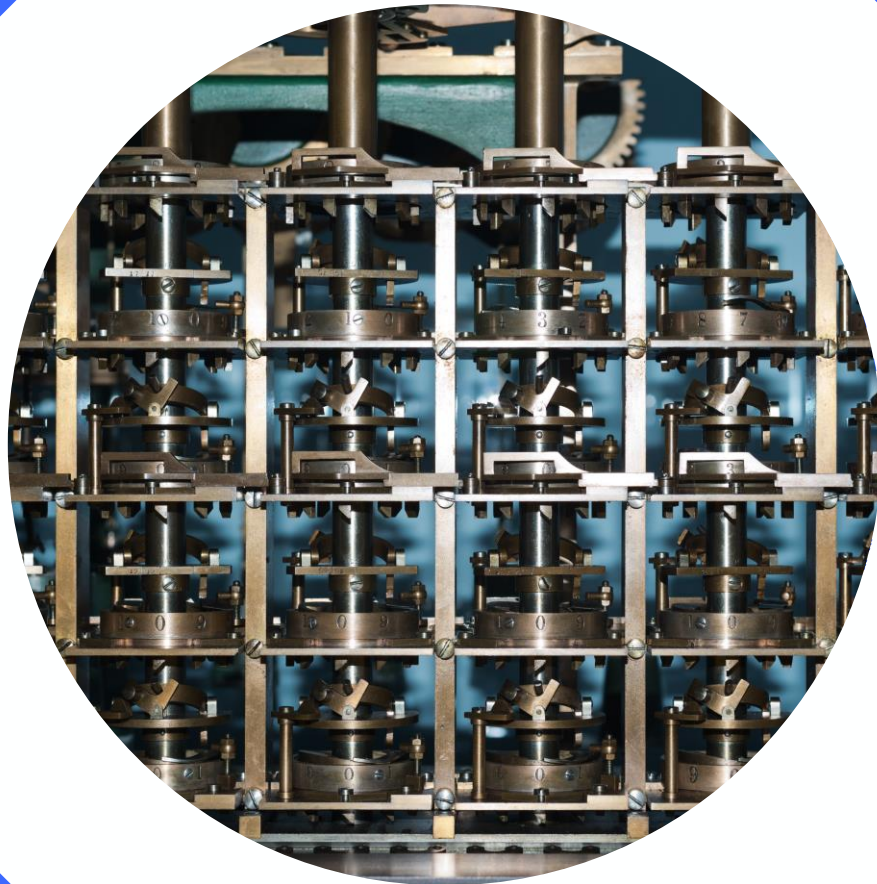


# Data Science Applications

## Microcredential Syllabus 2024





# 1. Overview and aim

The aim of the microcredential is to teach students how to apply a range of data science skills, such as neural networks, natural language processing, unsupervised learning and optimisation techniques, together with their professional judgement, to solve a variety of complex and challenging business problems. The business problems used as examples in this subject are drawn from a wide range of industries.

This microcredential is a direct copy of the Fellowship's Data Science Applications subject.

# 2. Student outcomes

After successfully completing this microcredential<sup>1</sup>, students will be able to:

- assess the impact of complex business environments on all stages of their data science projects;
- perform data science using a variety of tools and techniques to successfully solve realistic business problems; and
- contribute to the successful implementation of data driven change in an organisation.

# 3. Recommended background knowledge

If you choose to complete the microcredential assessments, you will benefit from having the following knowledge prior to commencing study:

- an understanding of the Data Science Principles subject syllabus; and
- a basic understanding of Python.

For further information, read the Recommended Background Knowledge [document](#).

There are no prior work experience requirements for undertaking this microcredential.

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<sup>1</sup> For those who take the certification options



## 4. Assessment method

There are three levels of assessment:

- Professional Certificate;
- Certificate; or
- Course.

The Professional Certificate is assessed via:

- an assignment worth 50%; and
- a three-hour (plus 15-minute reading time) open-book examination worth 50%.

The Certificate is assessed via:

- an assignment worth 100%.

The Course has no assessments and is relevant to those who want a high-level overview of data science and do not require any assessment of competency.

## 5. Learning objectives

- 1 Assess the impact of complex business environments on all stages of a data science project (30%)**
  - 1.1 Evaluate the impact domain knowledge has on the success of a data science project**
    - 1.1.1 Assess the influence of domain knowledge on all stages of a data science project
    - 1.1.2 Apply appropriate techniques to acquire domain knowledge
  - 1.2 Assess the impact of security and privacy considerations on data science work**
    - 1.2.1 Explain the principles that underpin an organisation's data security and privacy processes
    - 1.2.2 Outline the Australian security and privacy laws and regulations that apply to data science work



- 1.2.3 Contrast the security and privacy rules that relate to data science work in Australia with those that apply in the European Union and the United States of America
- 1.3 Apply ethical principles to data science work**
  - 1.3.1 Evaluate various ethical perspectives that influence data-driven decision-making
  - 1.3.2 Examine an ethical framework that drives a strong data ethics culture
  - 1.3.3 Outline the ethical guidelines that apply to data science work in different jurisdictions
- 1.4 Examine the role of data architecture in a data science project**
  - 1.4.1 Evaluate how well data describes business activity
  - 1.4.2 Explain data and database concepts
  - 1.4.3 Distinguish between different data sources and formats
  - 1.4.4 Recommend an effective data workflow
  - 1.4.5 Explain the benefits and challenges of real-time data flows
  - 1.4.6 Contrast cloud databases with internally hosted ones
- 2 Develop data science solutions to business problems using a variety of tools and techniques (60%)**
  - 2.1 Develop solutions to classification problems**
    - 2.1.1 Explain what a neural network is
    - 2.1.2 Explain how a neural network can be used as an alternative to GLMs or tree-based models to solve classification problems
    - 2.1.3 Develop solutions to a range of classification problems using GLMs, tree-based models, ensembling and neural networks
    - 2.1.4 Evaluate solutions produced by classification models
  - 2.2 Develop solutions to problems using unsupervised learning**
    - 2.2.1 Explain the purpose of dimension reduction
    - 2.2.2 Implement principal component analysis



- 2.2.3 Recognise alternative dimension reduction techniques
- 2.2.4 Explain how clustering techniques can be used to gain business insight
- 2.2.5 Contrast k-means and hierarchical clustering techniques
- 2.2.6 Perform k-means and hierarchical clustering
- 2.2.7 Discuss alternative clustering techniques
- 2.2.8 Evaluate a clustering algorithm using internal, external, and manual validation
- 2.3 Develop solutions to text analysis problems using natural language processing**
- 2.3.1 Explain what natural language processing models do
- 2.3.2 Outline the four key tasks of natural language processing
- 2.3.3 Describe a range of business problems that can be solved with natural language processing
- 2.3.4 Apply each step in the natural language processing pipeline to solve a variety of business problems
- 2.3.5 Explain transfer learning with pre-trained models
- 2.3.6 Evaluate the outcomes of natural language processing models
- 2.3.7 Explain the challenges that apply when using natural language processing models
- 2.4 Develop solutions to business optimisation problems**
- 2.4.1 Explain how optimisation algorithms can be used to make decisions when resources are constrained
- 2.4.2 Develop solutions to optimise business outcomes
- 3 Implement data driven change in an organisation (10%)**
- 3.1 Evaluate the key drivers of successful model deployment**
- 3.1.1 Assess the impact of domain knowledge on the successful deployment of a model
- 3.1.2 Identify stakeholders who can influence the success of a model's deployment



- 3.1.3 Choose a suitable form of model deployment and architecture pattern that meets the needs of users
- 3.1.4 Implement strategies for gaining stakeholder support for data science projects
- 3.1.5 Explain the important components of the model deployment process, including deployment issues that relate to customers, management, administration, IT and other areas of a business
- 3.1.6 Discuss options for testing a model prior to and post deployment
- 3.1.7 Explain the need to monitor a model's deployment over time



# Actuaries Institute.

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