# Postgraduate Diploma in Data Science

**DATA SCIENCE**
INSTITUTE

**THE PROFESSIONAL STANDARD IN DATA SCIENCE EDUCATION**

HCI Human Capital Initiative

Rialtas na hÉireann
Government of Ireland

Arna chomhchistiú ag
an Aontas Eorpach

Co-funded by the
European Union

EUROPEAN YEAR OF SKILLS

HEA | AN tÚDARÁS um ARD-OIDEACHAS
HIGHER EDUCATION AUTHORITY

**www.datascienceinstitute.net**

# Overview

The Postgraduate Diploma in Data Science is a fully rounded programme covering the key skills and knowledge needed by data scientists to develop insights and solutions across a wide range of industries and domains.

It has been developed by practising data scientists with experience working with major international firms across a wide range of industries.

They have identified key skills required for data scientists and have also ensured the course content conforms to the Edison European Data Science Framework's Body of Knowledge (DS-BoK).

# Aims

**The overall aims of the Postgraduate Diploma in Data Science will enable you to:**

- Gain the mathematical and statistical knowledge and understanding needed to carry out data analysis to an advanced level

- Develop essential data science skills in the R, Python and SQL programming languages

- Develop a strong understanding of data management, including evaluation, structuring and cleaning of data for analysis

- Become familiar with and apply the tools and techniques used in data visualisation

- Develop a comprehensive knowledge of classical data analytics, including statistical inference, predictive modelling and time series analysis

- Use new generation algorithms for supervised and unsupervised machine learning

- Apply a wide range of data science skills, knowledge and techniques within real world contexts, including building a portfolio of work to demonstrate a practical understanding of the field

# Accreditations

The Data Science Institute offers qualifications that are accredited by Woolf and Qualifi. The Data Science Institute is a full member college of Woolf, offering accredited degrees under the European Standards and Guidelines (Brussels 2015). The Data Science Insitute is also a recognised provider of Qualif,  a UK regulated awarding body regualted by Ofqual.

The Postgraduate Diploma in Data Science qualification is recognised at level 7 (Ireland NFQ level 9) and carries 60 ECTS credits.

## Progression

The credits you earn on the diploma contribute to the Data Science Institute's MSc Data Science. In order to complete the MSc you will undertake a 30 ECTS credit Postgraduate Major Project

*"Learning from data is virtually universally useful. Master it and you'll be welcomed nearly everywhere!' – John Elder, Elder Research*

# Why Choose this Programme?

## Industry Advisory Panel

Our Industry Advisory Panel comprises industry domain experts and practitioners, management consultants and academics. The aims of the panel are to ensure that our programme specifications, content and delivery methods are leading edge, industry relevant, academically rigorous and meet international university standards, as well as prepare graduates to be job and business ready.

## Our Faculty

With more than 50 years of cumulative experience in data science and advanced analytics our faculty has worked with over fifty clients on more than one hundred projects. In addition, they have delivered mulitple corporate training programmes and have regularly contributed academic research papers.

# Programme Delivery

### Online Course Content

You are provided with highly structured and detailed course content, broken down into ten distinct modules covering core skills and knowledge through our learning management system. This includes recorded video presentations, data sets, practice assignments comprehensive lecture slides, sample code for practice, exam prep questions and case studies based on real world industry examples.

### Communication and Collaboration

You will participate in regular scheduled live online group lectures and coding workshops and also have opportunities to interact with course mentors on a one to one basis throughout the course. In addition, you will be able to communicate and collaborate with your course colleagues on an ongoing basis.

### Course Duration and Commitment

The HCI Pillar 1 funded Postgraduate Diploma in Data Science is a one year full time programme,taking place over two semesters. There are 10 weekly contact hours during term time and you will also need to devote substantial time to working with the content on the learning platform, doing assignments and preparing for module exams.

### Assessment and Projects

The course is assessed by **assignments** and **exam** for each module of the course and **a guided capstone project** based on real-world data and scenarios provides the opportunity to bring together elements of the overall course.

# What you'll learn

## Module 1 topics

**Programming in Python, R and SQL**

**Data management**

**Measures of central tendency and variation**

**Bivariate relationships**

**Data visuallsation**

### Exploratory Data Analysis

Most industry analysis starts with exploratory data analysis and a thorough study of this will help you to perform data health checks and provide initial business insights. You will gain a sound understanding of Python and R programming, descriptive statistics, data management and data visualisation. You will also learn SQL for big data pre-processing and prepare data for big data analytics. The module serves as an essential foundation for advanced analytics taught later in the course.

## Module 2 topics

**Principles of statistical inference**

**Parametric tests**

**Non-parametric tests**

**Analysis of variance (ANOVA)**

### Statistical Inference

Statistical inference is the process of drawing inferences or conclusions from data using statistical techniques. This is at the core of data science, and a strong understanding of statistics from the beginning is the prime ingredient for a competent data scientist. In this module, you will cover sampling, statistical distribution, hypothesis testing, and variance analysis and use R code to carry out various statistical tests and draw inferences from their output.

## Module 3 topics

**Predictive modelling principles**

**LInear regression models**

**Model validation**

**Python and R packages for predictive modelling**

### Fundamentals of Predictive Modelling

Solutions to many business problems are related to successfully predicting future outcomes. This module introduces predictive modelling and provides a foundation for more advanced methods and machine learning. You'll gain an understanding of the general approach to predictive modelling and then build simple and multiple linear regression models in Python and R and apply these in a range of contexts.

# What you'll learn

## Module 4 topics

 Logistic regression models

Survival analysis

Cox regression

Poisson regression

## Advanced Predictive Modelling

In this module, you are introduced to model development for categorical dependent variables. Binary dependent variables are encountered in many domains such as risk management, marketing and clinical research and this module covers detailed model building processes. Multinomial and ordinal logisitic regression are also covered.

## Module 5 topics

Time Series concepts

Assessing stationarity

ARIMA, ARCH, GARCH modelling

Panel data regresssion

## Time Series Analysis

In this module, time series forecasting methods are introduced and explored. You will analyse and forecast macroeconomic variables such as GDP and inflation, as well as look at complex financial models using ARCH and GARCH, ARIMA, time series regression, exponential smoothing and other models.

## Module 6 topics

Principal Component Analysis

Factor Analysis

Multidimensional Scaling

Cluster Analysis

## Unsupervised Multivariate Methods

Data reduction is a key process in data science and you will learn to apply data reduction methods such as principal component analysis, factor analysis and multidimensional scaling. You will also learn to segment and analyse large data sets using clustering methods, another key analytical technique that brings out rich business insight if carried out skillfully.

# What you'll learn

## Module 7 topics

**Naive bayes**

**Support Vector Machines**

**K nearest neighbours**

### Machine Learning 1

Machine learning algorithms are new generation algorithms used in conjunction with classical predictive modelling methods. In this Machine Learning 1 module, you will understand applications of the support vector machine, K nearest neighbours and naive bayes algorithms for classification and regression problems using case studies from a range of industries and sectors.

## Module 8 topics

**Decision Tree**

**Random Forest**

**Association Rules**

**Neural Networks**

### Machine Learning 2

The Machine Learning 2 module continues developing your machine learning knowledge and you will cover decision tree, random forest and neural network algorithms for regression and classification, again drawing on case studies from real world data. You will have the opportunity to compare the performance of machine learning algorithms against classical statistical models and learn to assess which are most appropriate for specific scenarios.

## Module 9 topics

**Structured and unstructured data**

**Text mining in R and Python**

**Natural language processing**

### Text Mining and Natural Language processing

This module looks at analysing unstructured data such as that found social media, newspaper articles, videos and more.  In particular you will look at methods for text mining and natural language processing using R and Python code to produce graphical representations of unstructured data and carry out sentiment analysis.

# What you'll learn

## Data Science in Practice

The Data Science in Practice module provides you with an opportunity to yor apply knowledge through project work. You will select a project from a specific domain and appropriately apply exploratory data analysis, statistical methods and select appropriate advanced modelling techniques. This module also develops your scientific communication skills through the preparation of project reports and presentations.

## Module 10 topics

**Presentation and communication skills**

**Synthesis of data science knowledge**

**Application to real world data and scenarios**

# Take the Next Steps

## Opportunities

Holders of the Postgraduate Diploma in Data Science will find opportunities in data scientist roles across a wide range of sectors. Data Science and analytics is central to AI, machine learning, robotics and forecasting, and is used across a wide array of industries and professional functions such as those listed below:

| | |
|---|---|
| **Academia** | **Healthcare** |
| **Aerospace** | **Human Resources** |
| **Agriculture** | **Insurance** |
| **Banking and Finance** | **Logistics** |
| **Big Tech** | **Manufacturing** |
| **Cybersecurity** | **Marketing** |
| **Education** | **Medical Technology** |
| **Engineering** | **Pharmaceuticals** |
| **Energy** | **Sports** |
| **Environmental management** | **Telecommunications** |
| | **Utilities** |

Our students and graduates work for technology companies, consulting firms, specialist analytics and marketing consultancies, financial services firms and multinationals, including those in this sample:

**DATA SCIENCE INSTITUTE**

# Take the Next Steps

## Who should take this course?

The Postgraduate Diploma in Data Science is an advanced qualification designed for graduates with at least an NFQ Level 8 qualification or equivalent in a numerate discipline from a recognised institution. It is suitable for both those wishing to move into data science from other areas and experienced data analysts and data science professionals. Those with qualifications at levels 5-7 with substantial relevant experience will also be considered.

## Funding and Eligibility

The Postgraduate Diploma in Data Science is funded by the National Training Fund through the  Human Capital Initiative Pillar 1, with either 90% funding (employed, self-employed and recent graduates) or 100% funding (unemployed, previously self employed and returners). In order to be eligible for the course, applicants to the course must meet EU/EEA residency requirements.

## Application

Application for the HCI Pillar 1 funded Postgradute Diploma in Data Science can be made on the Spring-board Courses website.

## To find out more about the course

email: info@datascienceinstitute.net
or visit our website
www.datascienceinstitute.net/springboard-courses-ireland
WhatsApp: +353 89 973 5641
phone:  +353 01 442 9653
www.datascienceinstitute.net