



UNIVERSITY OF AMSTERDAM
Amsterdam Business School



Online programme

Data Science Essentials

abs.uva.nl/data-science-essentials

Data Science Essentials

Become a data scientist

The demand for data science talent is growing enormously. If you are working as a business professional and you are ambitious to dive into data science, the online Data Science Essentials programme might be your steppingstone towards becoming a data scientist and performing analytics and AI projects in your own business.

During this interactive programme, university lecturers and experienced consultants will share their knowledge and expertise on the topic. There will be plenty of room for discussion and work-related questions. The programme consists of 5 different modules. Choose which module fits your needs best or combine different modules.

The 5 modules of the Data Science Essentials online programme

	Module 1	Module 2	Module 3	Module 4	Module 5
	Python Programming Skills	Data Cleansing and Visualisation	Business and Soft Skills	Applied Machine Learning	Applied Optimisation
What?	Learn basic Python and SQL skills for working with data	Learn foundational skills to work with data and analytics techniques	Broaden your data science skills from a business perspective	Specialise in different Machine Learning algorithms and improve model performance	Specialise in recognising and modelling optimisation problems
Dates	19 & 26 January 2 & 9 February	2 & 9 March 16 & 23 March	30 March & 6 April 13, 20 and 29 April	11 & 18 May 25 May & 1 June	8 & 15 June 22 & 29 June
Times	13:00 – 17:00	13:00 – 17:00	13:00 – 17:00 (except 29 April, 13:00 – 15:00)	13:00 – 17:00	13:00 – 17:00
Combining modules	Combine this module with modules 2 and 4 or 2 and 5	Combine this module with modules 1 and 4 or 1 and 5	Possible to combine with any of the other modules	Combine this module with modules 1 and 2 or with module 2	Combine this module with modules 1 and 2 or module 2
PE hours*	14	14	16	14	14
Fee**	€1,950	€1,950	€2,250	€1,950	€1,950
Knowledge of Python required?	No	Yes	No	Yes	Yes

* Suitable for PE-portfolio, NBA-accredited.

** VAT exempt. UvA alumni receive a 10% discount. If you apply for two or more modules at once, you will receive a discount of €250 per module (from the second module on).

Modules

Module 1: Python Programming Skills

Python is a very popular programming language in data science. The goal of the module is to teach participants Python programming skills and SQL basics to apply in data science projects. You will learn practical and 'hard' skills for working with data.

What you will learn in this module?

- How to install and set up the tooling
- Data structures and syntax
- How to import data
- How to write loop functions and control flow statements
- How to manipulate datasets efficiently



Module contents and outline

Day 1: Programming fundamentals You will set up the tooling and learn about syntax and data structures.

Day 2: Control flows You will learn about the order in which to execute code. We will focus on logical statements, for loops and functions.

Day 3: Data manipulation You will be introduced to pandas (Python Data Analysis Library) and apply it to import and manipulate datasets.

Day 4: SQL fundamentals You will learn the basics of SQL, the language of choice for database querying.

Module 2: Data Cleansing and Visualisation

The goal of the module is to teach participants the practical and hands-on foundational skills to conduct data science projects. Unfortunately, data is often not handed to you on a silver platter; it can be incomplete, noisy, or inconsistent. You will learn the key concepts for working with data and analytics techniques. How to get to know the data you are working with, how to improve the quality of the data, and use it to create insights through visualisations. Basic python programming skills and SQL knowledge are required before you start this module.

What you will learn in this module?

- Understand the various steps that need to be taken to make data suitable for subsequent advanced statistical and machine learning techniques
- Apply fundamental techniques of data cleaning
- Identify data problems that require statistical techniques
- Apply statistical techniques correctly on data problems
- Understand properties of these techniques and the role of assumptions
- Interpret the conclusions properly
- Conduct the first (statistical) analysis on data, summarise the main characteristics and draw the first conclusions
- Understand the applicability of various visualisation techniques
- Apply visualisation techniques in Python



Module contents and outline

Day 1: Exploratory data analysis You will review basic descriptions of the data, create basic visualisations, and test correlations to become familiar with the data. You will also test preliminary assumptions and hypotheses, which will help you determine what to focus on in subsequent (advanced) analyses and visualisations.

Day 2: Statistics: the science of data How to perform "valid" data science? We will be discussing a range of topics that are relevant to data science, including: Basic statistics (mean, median, standard deviation etc.), Statistical distribution functions, Correlation and Causality, Sampling Methods and Linear regression.

Day 3: Data preprocessing Data preprocessing consists of restructuring, cleaning, validating, and correcting data. You will learn which kind of mistakes could be present in your data, to identify these in your data, and how to improve the quality of the data you are working with.

Day 4: Advanced visualisations The choices made in the types, selections and combinations of visualisations have an impact on how well the data behind them can be interpreted. You will learn to effectively communicate the insights from your data through visualisations.

Module 3: Business and soft skills

The goal of the module is to teach participants the practical and hands-on business skills to conduct data science projects. You will learn how to create business value by using your new skills to efficiently run data science projects to answer the key questions of your business. We will also address the key concepts and techniques for visualising data and storytelling.

What you will learn in this module?



- Bring to surface the real need of the business and link it to the bigger picture
- Relate the business question to analytics techniques
- Understand the need and applicability for SMART questions within data science
- Manage and participate in data science projects using Agile concepts
- Know what a data science team looks like and how to evaluate its performance
- Know the different stages of the data science project life cycle
- Be aware of possible threats and risks of big data for privacy and data protection
- Understand the purpose of various types of data visualisation, ranging from infographics to visual analytics, and apply them correctly

Module contents and outline

Day 1: AI strategy & value chain How do you connect the strategy of your business to AI and how do you get maximum value out of data science projects, given your high-level company goals? We will address data science opportunities along the value chain, analytics maturity level of a company as well as stakeholder management.

Day 2: Determining the right business question Asking the right business question starts from the business strategy. Going from a business case to a data science project requires refinement of the question, as well as a translation of the business question into the data science domain. We will discuss various techniques to help you make this abstraction.

Day 3: Running data science projects Once a data science project is defined, a multi-disciplinary data science team needs to execute it. We will discuss the various roles that are important in such projects, and the way in which they can work together (such as agile/scrum techniques).

Day 4: Storytelling with data Visualisation is a strong driver for understanding your data and convincing stakeholders and decision makers. We will understand the applicability of various visualisation techniques to support valuable story telling.

Day 5: Data and EU Privacy Law (2 hours) When you use personal data, privacy will be a point of consideration. The main principles and considerations of EU-privacy law to be taken into account will be addressed to prepare you for the decisions you will be facing in your business.

“The mix of academics and business help for a good theoretical understanding as well as practical implementation in your own business.”

Johan van Oosten

PostNL

Module 4: Applied Machine Learning

The goal of the module is to teach participants the practical and hands-on modelling skills to conduct data science projects applying machine learning. We will introduce and apply different algorithms and evaluate and improve model performance. Python programming skills are required before you start this module.

What you will learn in this module?



- Widely used algorithms in an introduction to Machine Learning
- Understand and apply algorithms for supervised learning and unsupervised learning
- How to evaluate and improve model performance

Module contents and outline

Day 1: Machine Learning – part 1 This module introduces the participants in the field of machine learning, which is an area where algorithms learn patterns from data, from which we can make predictions of the future. We will apply all the discussed algorithms in Python.

Day 2: Model performance, selection and tuning – part 1 This module discusses various methods to assess the performance of machine learning models and ways to improve upon your results.

Day 3: Machine Learning – part 2 We will continue covering amongst others the following algorithms: logistic regression, decision/regression trees, K-means clustering, and neural nets.

Day 4: Model performance, selection and tuning – part 2 We continue discussing meta-methods like ensemble learning (including Random Forests), parameter tuning and cross validation. We will pay attention to the balance between interpretability and accuracy as well.

Module 5: Applied Optimisation

The goal of the module is to teach participants the practical and hands-on modelling skills to conduct data science projects for optimisation problems. You will learn the key concepts for recognising and modelling optimisation problems. Python programming skills are required before you start this module.

What you will learn in this module?



- How to recognise business problems as optimisation problems and how to model them.
- Use Python to implement models and solve concrete instances of problems and interpret the results.
- Understand the role of uncertainty in business problems.
- Optimise with uncertainties in the data.
- Understand basic models for production planning, material acquisition, inventory management, business expansion, activity scheduling and many other important areas.

Module contents and outline

Day 1: The anatomy of a mathematical optimisation model

How to model decisions subject to constraints and valued in terms of costs or profits. A review of the most important results and methodologies of mathematical optimisation. Understand the magic of proven optimality and that nothing beats an optimum. First steps in using Python to express and solve models.

Day 2: Advanced modelling techniques We will illustrate different modelling techniques and you will get the chance to practice in the business domains listed above. Expect many hands-on moments with exercises in Python.

Day 3: Robust models for uncertain data Understand duality and how to create robust models. Practice with models from the previous day but now with data uncertainties.

Day 4: Dealing with huge models Learn how to deal with models that are too large to handle explicitly. Roundup.

Practical information

Participant profile and entry requirements

This programme is for business professionals who perform analyses of any form on data on a daily basis. The content is especially tailored to people who seek to get more from their data. A technical background or profound affinity with data science is a prerequisite, since you will be learning a programming language and will be developing competences in advanced statistics.

Relevant industries

Banks, Insurance Firms, Financial Institutions, Tax, Institutional Investors, Accountancy, Auditing, Consultancy, Services, Government, Energy, Telecom, IT, Internet, Marketing and Communication, Event Management, Logistics, Retail, Trade, Consumer Products, Freight, Healthcare and Pharmaceutical.

Combining modules

You can combine any of the modules to create the most interesting programme for yourself. Note however that the modules build up in level of experience with data science techniques.

Teaching staff

This hands-on data science programme will be lectured by university lecturers and experienced consultants. The consultants have been conducting data science projects for multiple years and have a wide range of practical experiences. They will share their best practices with you and warn you about the pitfalls of data science projects. The academic rigor with regards to research methods and statistics, vital for effective data science projects, will be taught by experienced academic lecturers from the University of Amsterdam.

Certification

After completion of one or more modules you will receive a certificate of attendance from the University of Amsterdam.

How can you apply?

You can register for this programme at abs.uva.nl/data-science-essentials.



Contact

If you have any questions regarding this programme or if you are not sure if your background fits the programme, please contact: Jannice Daha, Executive Education, executive-education@uva.nl, +31 (0)20 525 6134.

Collaboration

This programme is organised by The Analytics Academy, a collaboration between Amsterdam Data Science, ORTEC and the Amsterdam Business School of the University of Amsterdam. The three founding partners of the Academy bring a vast experience in data science education, for audiences ranging from senior management to hands-on data scientists in a wide variety of sectors and industries.

The Analytics Academy



Amsterdam
Data Science



UvA

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If you are interested in what The Analytics Academy can do to help your team to get data-driven, please contact us via executive-education@uva.nl or call Mireille Markink, +31 (0)6 49 86 35 94.

University of Amsterdam

Amsterdam Business School

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