



Data Science & Artificial Intelligence

Are you interested in human cognition? Would you like to learn programming and develop smart computers and systems? Do you want to understand AI, and how the technology works? In the bachelor's programme Data Science & Artificial Intelligence you gain a solid basis in computer science and mathematics with a focus on AI. You are going to study how to get insights from data and how to build smart machine capable of performing tasks. This requires human intelligence in order to provide useful applications for society.

Why study Data Science & Artificial Intelligence?

- The programme focuses on the combination of Computer Science and AI. It has a strong fundamental basis in computer science, mathematics and statistics combined to advanced machine learning, cognitive science and AI competence.
- Research-oriented: teaching is directly inspired by current research, and students can participate in research projects. Lectures will be given by

The structure of the bachelor's programme

Year 1

Introduction to Programming (6 EC)		Algorithmics (6 EC)	
Essentials of Computing Systems (6 EC)		Databases (6 EC)	
Foundations of Computer Science (6 EC)		Introduction to Logic (6 EC)	
Calculus 1 (3 EC)	Linear Algebra for CS 1 (3 EC)	Calculus 2 (3 EC)	Linear Algebra for CS2 (3 EC)
Studying and Presenting (3 EC)	Ethical and Social Aspect of AI (3 EC)	Introduction to Cognitive Science (6 EC)	

Year 2

Automata Theory (6 EC)	Machine Learning (6 EC)
Statistics for Computer Science (6 EC)	Human Robot Interaction (6 EC)
Software Development (6 EC)	Security (6 EC)
Symbolic AI (6 EC)	Cognitive Robotics (6 EC)
Introduction to Behavioural Data Science (6 EC)	Cognitive Neuroscience (6 EC)

Year 3

Introduction to Neural Computing (4 EC)	Bachelor Research Project (15 EC)
Natural Language Processing (5 EC)	
Software Engineering (6 EC)	
Electives, Minor or Study Abroad (15 EC)	Electives, Minor or Study Abroad (15 EC)

Learning trajectories

Computational thinking (54 EC)	Mathematical skills (24 EC)	Research skills (24 EC)
Basic AI (20 EC)	Intelligent systems (10 EC)	Cognition (18 EC)

Location: Leiden 

3 year programme, 180 ECTS

2022 English-taught programme established

2017 Dutch-taught AI specialisation established

30 maximum tutorial size

 bachelors.universiteitleiden.nl/data-science-and-artificial-intelligence



research staff from LIACS (Leiden Institute of Advanced Computer Science), Psychology and the Leiden University Centre for Linguistics.

- Balanced mix of theory and practice: most courses include exercise classes in which students practice theory in small groups.

Programme

The focus of this programme is on computer science, and its applications in Artificial Intelligence. You will receive a strong basis in mathematics, statistics and computer science, combined with advanced knowledge of machine learning, cognitive science and human-robot interaction. Additionally, you will learn to develop and program systems based on knowledge of the human brain. The programme focuses on six learning trajectories: computational thinking, mathematical skills, basis AI, intelligent systems, cognition, and research skills.

Programme structure

The **first year** gives a thorough grounding in the mathematical and formal foundation of data science and artificial intelligence. Mathematical support courses are needed for understanding the core concepts of modelling and algorithms. Special attention is paid to social and ethical issues related to data science and artificial intelligence.

The **second year** is dedicated to further enrichment in some of the key areas of artificial intelligence and data science: search and decision making, cognitive and behavioural data science, autonomous and multi-agent systems, statistics, human-robot interaction, and machine learning. In addition, students deepen their knowledge in computational models and algorithms.

The **third year** consists mostly of electives and the bachelor's project. Students can be assigned to

research groups at the institute, and can follow a minor at Leiden University, Delft University of Technology or Erasmus University Rotterdam.

Your future career

The knowledge with a Data Science & Artificial Intelligence diploma can be used to make computers and systems function in better ways and is used in many sectors: for example in business, where machine learning chatbots are used in customer service, in the production of automated news messages or in healthcare where automation ensures accurate diagnoses. Examples of careers in data science & artificial intelligence are Machine Learning engineer, data scientist, business intelligence developer.

Admission requirements

Students with a Dutch VWO diploma with Mathematics B (preferably within the VWO profile Nature & Technology or Nature & Health) are admitted directly to the bachelor's programme, after completing the compulsory matching activity. International students should have an equivalent of a Dutch pre-university education (VWO) diploma with a comparable level on Mathematics. The equivalent of Dutch VWO Mathematics can be acquired through:

- Having obtained the passing grade for the Online Mathematics Placement Test (OMPT-D);
- Having obtained the mathematics B certificate of Boswell Beta at the Boswell-Bèta Institute;
- For the mathematics requirements for the most common diplomas, see the document at the admission requirement page on our website: universiteitleiden.nl/admission-and-application.



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'Data science and artificial intelligence algorithms are designed to make decisions by insights derived on data. The bachelor Data Science & Artificial Intelligence at Leiden University will let you understand how these algorithms work, where they can be applied, and why they can solve problems that were considered impossible until now.'

Prof. dr. Marcello Bonsangue
Programme Director