Kristiania

Programme description

Bachelor
In Artificial Intelligence

Full-time

On-campus

180 ECTS credits

Valid from 2025

The study programme was accredited by Kristiania's Education Committee: 18.09.24 (SU-case 17/24)
The programme description has been approved by the Local education committee on 11.06.24 (LU/SEIT-case 58/24)

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1. Introduction

Artificial intelligence is a powerful tool for processing and analysing large amounts of data to automate tasks and create smart environments. It has gradually shaped our interaction with devices; our daily use of smartwatches and smartphones, extended use of applications such as weather forecast, chatbots, and email junk filters, and even smart cars. Nowadays, artificial intelligence also became an integral part in business operation as well as enhanced and sustainable development in nearly all fields. Starting from healthcare systems, surveillance and security, traffic control, finance, energy sector and load regulations, weather forecast, as well as smart vehicles and robotics. It is applied to enhance systems operations, optimize performances and use of resources, as well as smart monitoring and decision-making tools. At Kristiania, you will learn the basic knowledge and needed skills to solve problems using artificial intelligence by creating and implementing appropriate methods for each problem.

The study programme provides the students with the knowledge and skills in the artificial intelligence field with a focus on:

- Broad understanding of the basis of the artificial intelligence field and big data concepts as well as developing the required skills to apply them in different fields.
- Wide knowledge of the software tools used to develop artificial intelligence algorithms.
- Broad knowledge of different artificial intelligence algorithms including classical and advanced algorithms, and being able to develop, evaluate, critique, and apply them.
- Deep understanding of the ethical and regulation implication related to the development of a sustainable artificial intelligence algorithm.

The study programme starts with an introduction to math, probability and statistics, programming, and overview of the fundamentals of information technology with an overview on data bases, information security and cloud computing. Next, it provides the students with a thorough introduction on big data, data structures and analysis, and introduction on artificial intelligence. In the later semesters, the study model includes more specialized courses on core artificial intelligence methods such as machine learning, natural language processing, deep learning unsupervised learning, and explainable artificial intelligence.

The learning activities in each course are carefully selected to prepare the student to apply the accumulated knowledge, individually and in groups, to solve projects in different subjects. Where programming skills are central to problem-solving, the students will learn the design and implementation of artificial intelligence systems with associated back-end systems.
The study programme seeks an active collaboration with the industry and is closely linked to the artificial intelligence research community. Guest lectures, workshops, real-world projects/cases are among the course activities.

Research within the programme is anchored in artificial intelligence and data science fields. The programme will be intimately connected to the Artificial Intelligence Laboratory

(TheAILab) and all research groups at the School of Economics, Innovation, and Technology working in corresponding domains (MOTEL (Mobile Technology Lab), AISE (Artificial Intelligence in Software Engineering), SmartSecLab, and others). It is a well-recognized national and international environment with an extensive network of partners in the field of artificial intelligence.

Graduates of the bachelor in artificial intelligence have, for example, possible jobs such as:

- Data Analyst
- Artificial Intelligence / Machine Learning Specialist
- Data scientist

Moreover, the students will be able to work in the following domains connected to artificial intelligence, including:

- Artificial intelligence system operation in different fields such as health, public sector, energy, and finance.
- Machine learning systems development and testing.
- Big data and data mining.
- Data management and processing.
- Ethical artificial intelligence and sustainable analytics.

The career development studies that are available to students after finishing the bachelor program:

- Master's programs at Kristiania University College such as the programme in Artificial Intelligence or Master's programmes in other universities.
- PhD program in Applied Information Technologies at Kristiania University College or other universities.

2. Prerequisites

2.1. Formal prerequisites

Higher Education Entrance Qualification is required for admission. In addition, sufficient formal mathematic skills need to be documented (equal to Norwegian Mathematics R1 or S1+S2).

For applicants with a non-Nordic education a satisfactory English language proficiency is required. Please refer to the *Regulations concerning admission to higher education*[1] and *the Regulations concerning admission, courses, degrees, and examinations at Kristiania University College*[2] for further information.

[1] https://lovdata.no/dokument/SF/forskrift/2017-01-06-13

[2] https://lovdata.no/dokument/SF/forskrift/2018-06-01-813?q=H%C3%B8yskolen%20Kristiania

3. Learning outcomes

The learning outcomes describe what the student is expected to be able to do as a result of the learning acquired throughout the course. The learning outcome is divided into three categories: Knowledge, Skills and General competence. The different courses will have their own learning outcomes, which will contribute to the students achieving the learning outcome for the study programme.

Knowledge
The candidate

- has broad knowledge of the importance of artificial intelligence, underlying theories, applications, paradigms, tools, and methods used within the academic field
- is familiar with research and development work as well as cutting edge topics in the artificial intelligence field
- is able to build upon his/her knowledge to stay updated with the latest advances in the artificial intelligence field
- has knowledge of the history, techniques, and properties of artificial intelligence systems as well as its importance in the society and its impact on it

Skills
The candidate

- can apply academic knowledge and make theoretically well-founded choices to solve practical and theoretical problems using artificial intelligence
- can reflect upon his/her own academic practice in the field of artificial intelligence and adjust it under supervision
- can find, evaluate, and refer to information on a scholarly subject in the artificial intelligence field and present it in a manner that sheds light on the topic
- is able to design artificial intelligence frameworks and can master the use of the necessary tools, techniques, and forms of communication

General competence
The candidate

- has insight into relevant academic and professional ethical issues within the artificial intelligence field
- can plan and carry out varied assignments and projects over time, alone or as part of a group, and in accordance with ethical requirements, regulations, and principles
- can communicate important artificial intelligence theories, problems and solutions, both in writing and orally, as well as through other relevant forms of communication
- can exchange opinions and experiences with others with a background in the artificial intelligence field, thereby contributing to the development of good practice

4. The structure of the programme

Bachelor in Artificial Intelligence is run over three years. The programme counts a total of 180 credits, of which 150 credits are mandatory courses and 30 credits are elective courses.

Course of study is as follows:

Semester	Bachelor in Artificial Intelligence			
1st semester	**Data Ethics and Regulations** 7.5 ECTS	**Linear Algebra** 7.5 ECTS	**Python Programming** 7.5 ECTS	**Databases** 7.5 ECTS
2nd semester	**Big Data and Cloud Computing** 7.5 ECTS	**Probability and Statistics** 7.5 ECTS	**Information Security** 7,5 ECTS	**Visual Analytics** 7,5 ECTS
3rd semester	**Introduction to Artificial Intelligence** 15 ECTS		**Data Structures and Algorithms** 7,5 ECTS	**Programming** 7,5 ECTS
4th semester	**Electives or/ traveling abroad (student exchange)** 30 ECTS			
5th semester	**Unsupervised Learning** 7,5 ECTS	**Agile Project** 7,5 ECTS	**Deep Learning and Explainable AI** 15 ECTS	
6th semester	**Research Methods** 7.5 ECTS	**Bachelor Project** 22.5 ECTS		

Table 1: Course matrix

Mandatory courses	Elective courses

4.1. The content of the study programme

Below is a supplementary overview of the different courses the student will attend in every academic year. See the course pages for further information about each course.

1st Academic year

Course	Credits	Description
Data Ethics and Regulations	7,5	This course looks at the laws that regulate the use of data and the role of ethics in helping data scientists determine ethical pitfalls. The first half of the course introduces the fundamental principles of moral philosophy and ethics and their applications to data science processes and outcomes. The second half of the course looks at the various data regulations at the local, regional, and international level, and how these laws and regulations impact data science projects.
Python Programming	7,5	This course teaches basic Python programming knowledge, as well as advanced topics and libraries for data science. Students will learn how to use the Python programming language to work with numerical, string, and other data structure and sequences, to use expressions and control flows to perform data analysis. Students should also be able to import Numpy and Pandas to perform more complicated data storage and manipulation. Students should also be able to visualize results through using Matplotlib or Seaborn libraries. The course will start with basic programming skills, and then focus on open-source technologies. It would consist of lectures and hands-on training with open-source libraries in Python for data preparation, manipulation, and data visualizations. Finally, students will develop practical programming skills in problem solving by working on real-world datasets as part of their course project.
Linear Algebra	7,5	This course teaches linear algebra and other mathematical foundations of data science. Linear algebra is the mathematical foundation of data science that deals with planes, vectors and vector spaces, matrices and linear transformation of vectors and matrices, which provides basic foundations for machine learning. The course consists of lectures and hands-on training with open-source libraries (such as numpy and sciPy) in Python. Finally, students will develop mathematical skills that are needed to understand the foundations of various ML algorithms.
Databases	7,5	At completion of the course Databases, students will be able to explain what a relational database is, what it can be used for, and how it differs from other forms of persistent saving. Students will have learned how to model and structure data for a domain, as well as how to establish tables, enter various types of data, link tables and perform SQL queries. They will be able to explain and apply the principles of good design (normalisation and use of keys).
Big Data and Cloud Computing	7,5	The goal of this course are two-folds: First it provides knowledge of key concepts, methods, techniques, and tools of big data. Second, it provides an overview of cloud computing, its enabling technologies, main

		building blocks and architectures and hands-on experience through projects utilizing public cloud infrastructures (e.g. Amazon Web Services (AWS), Microsoft Azure). As part of these goals, the course will also introduce and cover the topics of cloud infrastructures, virtualization, software defined networks and storage, cloud storage, and distributed programming models such as map- reduce, parallel programming models like Dryad, dockers and containers and so on. The course will focus on open-source technologies to the extent possible and consists of lectures and hands-on training with open-source libraries and public cloud infrastructures such as AWS and Azure. Finally, students will develop practical programming skills in cloud storage systems and learn to develop different applications in several distributed programming paradigms.
Probability and Statistics	7,5	This course introduces theoretical principles of probability and statistics with a focus on practical applications in data science. Topics include but are not limited to permutations and combinations, frequentist vs. subjectivist probability, parametric vs. non-parametric statistics, probability distributions, Bayesian inference, null hypothesis significance testing, confidence intervals, effect sizes, point estimation, linear regression, multiple regression, and logistic regression.
Information Security	7,5	The current threat landscape is characterised by increasingly advanced attacks against private and public targets. Both organised cybercriminals and state actors use the digital domain to carry out cyberattacks for economic gain or to take control of third-party systems. Awareness of the various threats that exist on the internet is a premise for making appropriate measures. After completing the course, the student should be able to analyse the threats and perform security measures on their own machine, in home networks, and provide professional advice on setup and technology choices for internet-exposed systems. The student should have an overview of the laws and regulations that apply to the use of computers for storing, processing, and presenting data, including privacy protection and copyright. The student should also gain insight into how user awareness and user training play an important role in information security.
Visual Analytics	7,5	This course teaches principles and techniques for visual analytics of organizational datasets. The course will enable students to design and develop data visualization for applications in various domains. The students will be able to reflect upon the different models, theories, and frameworks for visual analytics from a decision-making perspective. The students will also work in groups and learn to communicate effectively involving technical and non-technical people assisting in informed decision making.

Table 2: Courses in the first academic year

2nd Academic year

Course	Credits	Description
Data Structures and Algorithms	7,5	The course will provide insight into algorithms and data structures that are central to the work of implementing and designing effective computer systems. Emphasis is placed on asymptotic analysis of worst-case scenarios, as well as central algorithms and data structures.
Programming	7,5	The course aims to give students knowledge of fundamental and advanced programming concepts in the language C++, and to further develop students' programming knowledge to the level necessary to develop efficient and complex systems including embedded systems. In addition to C++, students will also learn to use relevant IDEs and other tools for developing software for embedded systems.
Introduction to Artificial Intelligence	15	This course is split into three main parts. In the first part, the students will learn about the history of AI and ethical considerations. The second part will focus on the main concepts of AI such as what are models, agents, architectures, algorithms, etc. In this part, the students will also get some hands-on experience with supervised learning algorithms. The third part of the course will focus on how to determine if an AI system is good or not, both in terms of performance and ethically.

Table 3: Courses in the second academic year

3rd Academic year

Course	Credits	Description
Deep learning and explainable AI	15	The course provides knowledge of the key concepts, techniques and methods related to deep learning and explainable artificial intelligence methods. The students gain in-depth knowledge of mathematical foundations of deep learning, neural networks and gain advanced skills in applying the appropriate tools, techniques and development of the respective areas. Furthermore, the course provides the students with practical hands-on experience on deep learning using open-source deep learning libraries in the Python programming language. After completing the course, the students will be able to apply and use appropriate deep learning techniques and explainable AI within various data science domains.
Agile Project	7.5	The purpose of the course is to give the student an experience in mastering the whole of a project, with emphasis on applying a flexible method: Scrum. Scrum is a flexible process framework for developing innovative products and services, especially suitable for software development.

		Through a process for developing a technical solution, the student will plan and implement a comprehensive project case for a company in a multidisciplinary group and will receive training in using modern agile techniques and tools along the way.
Unsupervised Learning	7.5	The student learns about different machine learning algorithms using unsupervised methods. The course provides the student with the basics and tools of performance evaluation and definition and significance of different evaluation metrics. Students will also learn how to visualize the output of their methods so it can be interpreted and discussed with domain experts.
Research Methods	7.5	The course aims to introduce research methods with a focus on methods that are especially relevant for the IT business. The course supports the bachelor's degree project.
Bachelor Project	22.5	The students will get practical, real-life experience by carrying out a project in a company, establish their own business, or participate in a research project. They will be able to demonstrate broad knowledge of central topics and theories and to show skills in using methods, tools, and technology.

Table 4: Courses in the third academic year

Elective courses

In Bachelor in Artificial Intelligence, students can choose to either go on student exchange or choose elective courses in the 4th semester, adding to a total of 30 ECTS. Students are given information regarding the up-to-date list of elective courses on the Kristiania Website and through the learning platform.

Kristiania reserves the right to change the elective courses offered.

5. Forms of teaching and assessment

The courses and the study work in Bachelor in Artificial Intelligence will lead the students towards the learning outcome described in chapter 3 of this programme description. Kristiania strives to facilitate the students' work through good learning designs, which means that the students should encounter a variety of learning activities and forms of assessment throughout their studies, which are relevant to the working life. The work will require a significant effort on the student´s behalf.

Students can be assessed both during courses, for example by fellow students and lecturers, with the aim of increased learning, and for the exam where the purpose is to measure the achievements in the course which will result in grades on the diploma. In its entirety, the study programme will provide a specialized competence within the artificial intelligence field.

Courses may have compulsory activities. A compulsory activity is a requirement that must be approved in order to sit for the exam. If a compulsory activity is not approved, the student loses the right to sit for the examination, until the activity(s) has been assessed as approved.

Kristiania is committed to providing education relevant to working life, and will, in addition to teaching and assessment forms relevant to working life, facilitate professional events, where guest lecturers, external organizations and business actors can participate.

In addition to timetabled teaching, Kristiania has available subject resources, including administrative staff, librarians, digital learning resources (e.g. online films) and student tutors. These can be contacted by the individual student if necessary.

The course descriptions for each course provide an overview of the teaching and assessment forms in the individual courses. For additional information about the exam and compulsory activities, see Kristiania's website.

6. Internationalization and student exchange

In Bachelor in Artificial Intelligence, it is possible to go on an international student exchange and the teaching at campus will put the study in an international context.

6.1. Schemes for internationalization

Bachelor in Artificial Intelligence has schemes for internationalization that place the study in an international context and which means that the students will be exposed to a diversity of perspectives throughout the programme. The courses in the programme are all taught in English, thereby facilitating for incoming exchange students. Historically, approximately one third of the class size consists of international students which encourages an international student environment.

The arrangements for internationalization in the Bachelor in Artificial Intelligence can include a number of activities, such as the use of international literature, international guest lecturers, foreign students on exchange or students' participation in international conferences or workshops abroad (the list is not exhaustive).

The course descriptions provide further information regarding the specific schemes for internationalization in the different courses.

6.2. Schemes for international student exchange

For Bachelor in Artificial Intelligence, students can go on exchange in 4th semester. Kristiania has agreements with several foreign educational institutions that give the opportunity to take part of the study abroad.

The following institutions abroad are relevant for Bachelor in Artificial Intelligence:

- University of Odisee, Brussels, Belgium.
- Arcada, Nylands Svenska yrkeshogskola, Finland.
- Reykjavik University, Iceland.
- Seoul National University of Science and Technology, South Korea.
- University of IADE, Lisboa, Portugal.
- Kingston University, England.
- Southampton Solent University, England.
- University of Hertfordshire, England.
- Frankfurt University of Applied Sciences, Germany.
- University of Koln, Germany.
- Åland University college, Åland, Finland.
- Metropolia University of Applied Sciences (EkoTekNord), Finland.

- Universitat Politecnica de Catalunya UPC, Spain

Kristiania has the following mobility programmes:

- Nordplus in the Nordic and Baltic countries
- ERASMUS+ in Europe
- 'Study Abroad', for students within and outside Europe

In order to be able to go on exchange, the student must be on a degree-granting programme and have achieved a minimum of 60 ECTS at Kristiania at the time of departure. For both on-site and online studies, the exchange is location-based.

For nominations for student exchange, requirements are set for grades and motivation applications. For some study programmes there are requirements for documentation of creative work / portfolios. Please note that there is a limited number of exchange places at the study locations.

Changes to approved universities may occur. Information about possible exchange stays for the relevant year is therefore published online and on the learning platform.