Kristiania

Program description

Master in Artificial Intelligence

Full-time

On-campus

120 ECTS credits

Valid from 2024

The study program was accredited by Sentralt utdanningsutvalg: 10.10.2023 (SU-case 24/23)

The program description has been approved by the Local Education Committee at School of Economics, Innovation, and Technology: 22.09.2023 (LU/SEIT-case 9/23)

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1. Introduction

The Master in Artificial Intelligence program will build and develop your ability to acquire the solid knowledge and mandatory skills required to analyze the significantly complex and dynamic digital world today. Artificial intelligence is prevalent in our daily practices and activities, and analytics skills are increasingly needed in most fields and industries. Upon completion, candidates will be able to take a leading role in different organizations within the artificial intelligence and data analytics fields.

The study program will cover broad knowledge within the artificial intelligence field with a focus on:

- Deep understanding of the basis of artificial intelligence and data analytics concepts as well as mastering the skills to apply it in different fields.
- Wide knowledge of different artificial intelligence algorithms including the classical and advanced algorithms, and being able to develop, evaluate, criticize, and apply them.
- Wide knowledge of the software tools used for artificial intelligence algorithms and advanced data analytics.
- Deep understanding of the ethical aspects related to artificial intelligence algorithm development and having an awareness of the sustainability requirements in the field.

Moreover, the students will be able to work in the following domains connected to Artificial Intelligence such as:

- Artificial intelligence system developments, regulations, and usage in different fields such as health, public sector, finance, industry
- Machine learning systems development and testing
- Big data and data mining
- Data management and processing
- Data science and system development
- Ethical artificial intelligence and sustainable analytics

Upon completion of the master's program, successful graduates will have opportunities for jobs that include but are not limited to:

- Data analyst
- Artificial intelligence consultant
- Data scientist

Kristiania University College has the necessary competence and staff members with relevant qualifications and research portfolios to teach and supervise students in artificial intelligence. The program 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.

The academic career opportunities available to graduates include the Ph.D. program in Applied Information Technologies at Kristiania University College or similar Ph.D. programs at other Norwegian universities or abroad.

2. Prerequisites

2.1. Formal Prerequisites

To be qualified for enrolment in the Master in Artificial Intelligence program, applicants must meet the following requirements:

The applicant is required to have a bachelor's degree, cand.mag. degree or an equivalent degree of at least 180 ECTS.

Grade requirement:
To be qualified, applicants should have a minimum average grade of C or higher on the ECTS-scale. Relevant specializations, practices, and subjects, due to other special considerations, may, in some cases, weigh up for non-compliant grade requirements.

Specialization requirement:
Minimum 80 ECTS of which should be within one of the following specialization areas:

- computer science
- information systems
- informatics
- information technology
- computer engineering
- or related disciplines

Course requirement:
Applicants must have at least the following courses:

- 15 ECTS of programming (preferably Python)
- and 7.5 ECTS of Mathematics
- and 7.5 ECTS of Statistics

3. Learning Outcome

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.

Knowledge

The candidate …

- has advanced knowledge within the academic field of artificial intelligence and specialized insight in data types and structures, data mining and management, data preparation and processing for different phases, as well as machine learning and advanced analytics methods.
- has a thorough knowledge of the theories and methods in the field of artificial intelligence.
- can apply knowledge to new application areas within the artificial intelligence field.
- can select the appropriate analysis for different academic problems in the artificial intelligence field knowing their distinctive characters, historical development, and impact on the academic field.

Skills

The candidate …

- can analyze and deal critically with different types of data and use them to develop artificial intelligence algorithms.
- can analyze and evaluate existing algorithms in the field of artificial intelligence and work independently to criticize them.
- can use relevant methods for research and develop their own research project.
- can independently develop a project following an artificial intelligence framework for relevant industry problems and following applicable norms for research ethics.
- Can analyze and deal critically with various sources of information and use them to structure and formulate scholarly arguments.

General competence

The candidate …

- can analyze problems related to ethics and regulations in the academic, professional, and research field of artificial intelligence.
- can apply their knowledge and skills in new areas to carry out advanced assignments and projects in the artificial intelligence field.
- can communicate extensive independent work and master the language and terminology of the academic field both written and oral.
- can communicate about academic issues, analysis, and conclusions in the field, both with specialists and the public using oral and written communications..
- can contribute to new thinking and innovation processes.

4. The Structure of the Program

Master of Artificial Intelligence is run over two years (full-time). The program counts a total of 120 credits, of which 60 credits are mandatory courses, 30 credits are elective courses, and 30 credits are part of the Master Thesis.

Course of study is as follows:

Semester	Master in Artificial Intelligence			
1st semester	**Introduction to Artificial Intelligence** 7.5 ECTS	**Data Mining and Computational Vision** 7.5 ECTS	**Big Data Systems** 7.5 ECTS	**Ethics, Sustainability, and Society** 7.5 ECTS
2nd semester	**Advanced Machine Intelligence and Deep Learning** 7.5 ECTS	**Smart Analysis and Decision Making** 7.5 ECTS	**Research Methods** 7.5 ECTS	**Proposal Development** 7.5 ECTS
3rd semester	**Elective courses from the relevant area of study or broader topics** 30 ECTS			
	Alternative: Student exchange 30 ECTS			
4th semester	**Master Thesis** 30 ECTS			

Table 1: Course matrix

Mandatory courses	Elective courses

4.1. The Content of the Study Program

Below is a supplementary overview of the different courses the student will attend during each academic year. Throughout the courses, the students will learn both theories and practices. See the course pages for further information about each course.

1st Academic Year

Course	Credits	Description
Introduction to Artificial Intelligence	7.5	This course provides a broad introduction to regression, classification, and clustering methods. It introduces the fundamentals of supervised and semi-supervised methods and their applications. The students will be familiar with the commonly used algorithms such as supported vector machine, random forests, and logistic regression.
Data Mining and Computational Vision	7.5	This course provides a broad introduction to different types of data mining and required tools. The student will develop the understanding of the main stages of data mining and technologies. The course also provides the students with the general knowledge of the fundamentals of computer vision.
Big Data Systems	7.5	The course will provide insights into methods and algorithms for big data systems. The student will be familiar with different big data structures and usage of the convenient algorithms. The student will have a broad understanding of the big data systems' design and performance trade-offs. Throughout the course, the students will learn both theories of big data systems and practice their design and implementation.
Advanced Machine Intelligence and Deep Learning	7.5	This course provides a broad introduction to advanced machine intelligence algorithms which includes unsupervised, transfer, and reinforcement learning. It introduces the fundamentals and applications of convolutional networks and deep learning methods. The students will develop a broad knowledge of the foundation of interpretable and explainable methods.
Smart Analysis and Decision-Making	7.5	Throughout the course, the student will be able to distinguish the difference between classical and modern data analysis. It also provides the students with the general knowledge of the stages and fundamentals of feature analysis and algorithm performance analysis. This course provides a broad introduction to data driven decision making frameworks. The student will be able to conduct algorithm performance analysis, testing, and validation.

Ethics, sustainability, and society	7.5	The main aim of this course is to provide students with the fundamental knowledge of ethics and sustainability necessary for responsible innovation and the development of modern technologies in modern society. The central topics include the role of ethics in responsible innovation and the development of information technology (IT); social, economic, and environmental impacts of innovations and modern technologies; and how IT development and innovation can contribute to achieving the UN Sustainable Development Goals. In covering ethical and sustainability issues, the course addresses the perspectives of various stakeholders at the individual level (IT developers, innovators, consumers, investors), the organizational level (commercial, public, and non-governmental organizations), and the societal level (local and regional communities, nations, international society). Group work on viable solutions to real-life ethical and sustainability challenges constitutes an essential part of the course.
Research methods	7.5	Research is a cyclical process where new and carefully planned investigations build and extend on established work. The aim is to provide students with a fundamental understanding of research as a conceptual, empirical, and practical approach to gathering new insight and knowledge. The content provides a broad overview of how researchers work in the economy, innovation, and technology. It presents students with relevant methods from these domains, along with their possibilities and limitations. Students will learn a systematic approach to empirical investigation, including literature search, research design and methodology, qualitative and quantitative analyses, and the presentation and evaluation of results. After the course, students can study and interpret existing research on a topic and suggest approaches to broaden or deepen knowledge within a given topic.
Proposal development	7.5	This course's main objective is to help students conceptualize and prepare a research proposal in their area of interest and to nurture a sense of curiosity and active participation in research. The course has an applied approach that involves collaborative and reciprocal partnerships between the university (faculty, staff, and/or students) and external communities for the mutually beneficial exchange of knowledge and resources.

Table 2: Courses in the first academic year

2nd Academic Year

Course	Credits	Description
Electives	30	(Read more below and at our website)
Master thesis	30	The master thesis is a research project in which students will apply the knowledge acquired during their studies. It is a crafted scholarly document presenting research questions and original arguments based on scientific methods under the guidance of an advisor. The thesis gives the student the opportunity to demonstrate expertise in their chosen research area. Students will acquire specialized problem-solving skills, being able to plan and conduct the steps in the research and/or development process at a high methodological standard. They shall take responsibility to conduct a well planned and executed project.

Table 3: Courses in the second academic year

Elective Courses

In the Master in Artificial Intelligence program, students can choose 30 ECTS of electives in the 3rd semester. The students will be given the flexibility to specialize in topics they want, either in artificial intelligence, aligned master programs, or spending one semester abroad at one of the partner universities.

There is an ongoing process of developing the subjects at the master's level depending on current needs in the industry. Therefore, the students have access to the most up-to-date topics in artificial intelligence and information technologies through the following courses.
The list of the elective courses to be offered at Kristiania University College in the table below is subject to changes considering modern technology development. To facilitate the selection of the electives, the students will be offered a set of three recommended focus areas identified in the program's structure above to focus on building a corresponding career path.

Courses	ECTS
Health Analytics	7.5
Business Analytics	7.5
IT Governance	7.5
Mobile Computing and Internet of Things	7.5
Secure Software Development	7.5
End-Point and Cloud Security	7.5
AI (Artificial Intelligence) for Cyber Security	7.5
Energy and Workload Analytics	7.5

5. Forms of Teaching and Assessment

The courses and the study work in Master in Artificial Intelligence will lead students toward the learning outcomes described in Chapter 3 of this program description. Kristiania supports student achievement through good learning designs. This means that the students will encounter a variety of learning activities and forms of assessment throughout their studies, many of which will be relevant to the working life after graduation.

The program will require significant effort. Students can be assessed both during courses, for example by fellow students and lecturers with the aim of increased learning, and via exams, where the purpose is to measure the achievements award grades. In its entirety, the study program will provide a specialized competence within the artificial intelligence field.

In some courses, there may be compulsory activities. A compulsory activity is a requirement that must be approved to be able 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.

The student will be connected to our active learning and research facilities like the Artificial Intelligence Laboratory (TheAILab) and all research groups at the School of Economics, Innovation, and Technology working in the corresponding domain (MOTEL, AISE, SmartSecLab, and others).

Kristiania is committed to providing education relevant to working life, and will, in addition to academic teaching and assessment forms facilitate professional learning activities relevant to working life. The program's academic teaching activities address both the students' hard and soft skills and include the students as an integral part of the educational process. While the knowledge is accumulated through activities such as classical lecturing, individual and group presentations, project-based learning, and group/team tasks, these activities also aim to develop students' soft skills such as the communication skills, presentation skills, teamwork, problem solving, and project planning/management. The professional learning activities include invited guest lectures by experts in the field and industry, participation in professional and cutting-edge events, and professional workshops and events in which 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 desired.

The course descriptions for each course provide an overview of the teaching and assessment forms in the individual courses. Home assignments and portfolio exams will often be used to test the students' skills to develop an artificial intelligence project. Moreover, A-F grading according to the Norwegian grading scale is used as it matches the universal grading

internationally. This facilitates student mobility and the degree evaluation in other countries. For additional information about the exam and compulsory activities, see Kristiania's website.

6. Internationalization and student exchange

The Master in Artificial Intelligence program provides opportunities for international student exchange. Moreover, the on-campus teaching is conducted with a focus on internationalization.

6.1. Schemes for Internationalization

Master in Artificial Intelligence has schemes for internationalization that place the study in an international context, which means that the students will be exposed to a diversity of perspectives throughout the program. The courses in the programme are all taught in English, thereby facilitating 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 Master in Artificial Intelligence can include several 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

During the Master in Artificial Intelligence, students can go on exchange in 3rd semester. Kristiania has agreements with several foreign educational institutions that allow taking part in the study abroad.

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

Frankfurt University of Applied Sciences, Germany
TH Köln, Germany
UPC Barcelona, Spain
IADE (Ensilis) Faculdade de Design, Technologia e Communcaceo, Portugal

Kristiania has the following mobility programs:

- 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 program 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 programs, 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.