OPIT Open Institute of Technology

Master of Science in Applied Data Science & AI
Fact Sheet

Overall Program Description

Data is today's "digital gold". Most companies in virtually every industry generate a huge quantity of data. Data Science and Artificial Intelligence can help automate and streamline various data-related tasks, making it easier to extract insights and make informed decisions to create better products, improve operations, measure results and, ultimately, improve businesses.
However, most of the companies today struggle to do so. Field experts without a tech background typically find it hard to read and analyze data due to little to none technical knowledge. Conversely, people with a Data or AI background do not know how to use the insights gathered from the data due to little domain knowledge.
OPIT's MSc in Applied Data Science & AI is built for students without a computer science background who want to join companies and be the connection between their management and the tech departments, by guiding the data and AI roadmap, interpreting data analyses, assisting the management in making strategic, informed decisions based on data.

The program will go through 3 phases, one for each Term:
Building solid foundations on applied AI & Data, Business, Critical thinking
See and touch in first hand how AI and Data Science can be applied to real life problems and dataset in multiple industries in order to extract meaningful and actionable insights, with the participation of guest Lectures from prominent companies and labs
Consolidating what has been learnt through a 13 week long final project, dissertation or internship
All teaching and learning activities will take place online as the program is taught remotely through a dedicated platform and live interactions with professors, tutors, mentors, and company speakers. Get-together events will be periodically organized, where faculty members and students can interact in workshops and online social events.

The program includes 60 ECTS of taught modules and a Capstone Project and Dissertation module that is worth either 30 or 60 ECTS. Before the beginning of the Capstone Project and Dissertation module, the students must select either the 30 or the 60 ECTS instance of the module, and their choice will be recorded in appropriate internal documentation. Their effort and time commitment to complete the module will be suitably calibrated by the supervisors according to their choice.

Target Audience

Ages 19 – 30	☒	Age 31 – 65	☒
Age 65+	☒		

Target Group

OPIT's MSc in Applied Data Science and Artificial Intelligence (AI) is built for:

- Students who do not necessarily have a scientific or technological background and want to career-switch in Applied Data Science and AI.
- Professionals who want to upskill by developing a "strategic" vision and strong management skills in the field of Data Science and AI applied to real-life problems.

The ultimate purpose of this programme is to connect students from different areas and show them how they can use Data Science and AI tools in their field of application.

In order for this programme to be accessible to students without a technical background, it is structured in a way that no technical pre-requisite is necessary. Though, in order to ease and to facilitate access to the programme by students without a tech background, OPIT will offer them free, optional access to teaching materials for filling possible gaps in basic programming skills.
The supplementary teaching materials will be made available in the form of asynchronous content (videos, exercises, references) accessible through the Virtual Learning Environment one month before the start of the MSc program.
More precisely, OPIT will release the content of the following modules: Programming Principles, ICT Fundamentals, Computer Architectures.
Such modules will provide students coming from non technical disciplines (e.g. Law) with the basic knowledge needed to fill the gaps.
Moreover, the technical courses offered during the first Term of the proposed MSc program are specifically designed to progressively introduce students to the technical topics later covered in the program.

The MSc programme's main goal is thus to train students to become skilled professionals capable of interfacing both with business decision makers and with technical units, in companies and in research labs.

After concluding the MSc program, students will be able to join companies/labs and act as the connection between the management and the technical departments by guiding the data roadmap, interpreting data analyses and assisting the management in making strategic and informed decisions based on data.

Entry Requirements

The admission requests from new applicants are received by the Students Secretary Office, which will conduct an interview with the applicants.

Students will need to provide the following documents for admission:

1. Updated CV in English;
2. Copy of a valid ID (front and back);

Qualifications:

3. University degrees (MQF level 6 or higher) in Computer Science, Computer and Electrical Engineering, Mechanical Engineering, Aerospace Engineering, Physics, Mathematics, Statistics, Chemistry, Biology, Geosciences, Economics, Law, Liberal Arts, Medical Sciences.

Since all OPIT programs are taught in English, a proof of language proficiency is needed. Any of the following options is accepted as a proof of English proficiency:

1. Being an English native speaker;
2. Having completed a previous degree entirely taught in English;
3. Having passed one of the following English tests:
    - TOEFL (minimum 80 points)
    - IELTS (minimum Level 6)
    - Duolingo English Test (minimum 95 points)
    - Cambridge Certificate (minimum B2 grade overall)

Students, who do not hold the requested level must sit for the English Entry Test in order to certify the students' competences.

All the enrolled students will follow an Induction Module before the beginning of the chosen training. This will explain to the student all the policies and procedures outlined in this handbook, and specific information related to the training, such as learning outcomes and expectations.
Study Guidelines will also be shared. Induction will also include a handbook and/or a tutorial lesson related to the different functionalities of the Virtual Learning Environment and how to use it. If students have any specific requirements or needs, they should inform the Students Support Office.

During the admission process of students wishing to enroll to the program, we will also ensure that such students have the required basic digital competence to successfully complete such a course. We will do so by administering to such students a standardized questionnaire that will cover aspects including, but not limited to: the availability of a PC with a webcam and speakers, the availability of an adequate internet connection, basic knowledge of operating systems and web browsers.

The program is open to all candidates who hold at least a bachelor's degree (180 ECTS EQF/MQF level 6 in STEM fields (Science, Technology, Engineering, Mathematics), Business Administration, Information Security, Law, Liberal Arts, Medical Sciences, Humanities) from an accredited institution. However, the program is designed by assuming some baseline technical proficiency in

computer science. To this end, the program offers an entry path that allows to fill possible gaps in terms of such requirements.

Direct Entry: A bachelor's degree (180 ECTS EQF/MQF level 6) from an accredited institution with a proven record of knowledge of basic computer science topics. Notably, the Direct Entry path assumes candidates are familiar with the concepts discussed in courses equivalent to the following OPIT's courses:
COMP-1003 Programming Principles
COMP-1004 Computer Architectures
COMP-1005 ICT Fundamentals

Alternative Entry: Applicants who hold degrees (at least a BSc with 180 ECTS EQF/MQF level 6) without a proven record of knowledge of basic computer science topics. In order to ensure success in the program, such applicants will be required to undergo specialized assessments to evaluate their foundational skills. The Basic Competencies Assessment (BCA) will be based on the following preparatory modules taken from OPIT programs, which are offered free of charge during summer, before the start of the first Term:
COMP-1003 Programming Principles
COMP-1004 Computer Architectures
COMP-1005 ICT Fundamentals

The BCA consists of a test with a mix of multi-choice and open-ended questions. If a student fails more than 50% of the questions, the test is considered as failed. Students not clearing the BCA will have an opportunity for a retake after a dedicated period of remedial guidance, within the same academic year.

Recognition of Prior Learning
OPIT recognizes previous academic and professional experience in different ways. Procedures that describe the mechanisms related to admission and RPL are entirely described at the following webpage:

https://www.opit.com/fee-admission/

Learning Outcomes for Knowledge obtained at the end of the programme	The learner will be able to: a) Comprehend the inner workings of computing and information systems b) Define, describe and use the Python programming language c) Define, describe and use business processes in various fields, such as Healthcare, Sports, Finance, and Energy d) Make informed decisions and provide recommendations regarding the choice of Data Science and AI models and algorithms e) Apply Data Science and AI models to real world datasets f) Comprehend the business-side of Data Science and AI projects g) Investigate the use of specialized methodologies in Data Science and AI h) Acquire the ability to communicate technical concepts effectively to decision makers i) Acquire the ability to communicate business decisions to technical units
Learning Outcomes for Skills obtained at the end of the programme	The learner will be able to: a) Use the Python programming language and related functionalities b) Use modern Data Science and AI libraries in Python c) Use several Data Science and AI models and algorithms d) Apply business and project management strategies e) Apply algorithmic and mathematical reasoning to real-world problems f) Map real-life processes and identify deficiencies g) Integrate Data Science and AI projects in bigger software applications h) Ability to work effectively in groups by sharing information and responsibilities between different roles i) Use current tools and methodologies in computing projects j) Analyze and compare alternative solutions to computing problems

General Assessment Methods

Assessment methodology:
Students will be assessed with a continuous assessment methodology, i.e. with one or more assessed exercises (also called assessed components) defined by the Lecturers to be completed during the Term. For instance, assessments through the module might weigh 40%, the final project can weigh 60%. Such marked exercises include projects, take-home written tests, multiple choice quizzes, and other forms of assessment.

Grading and passing grade:
Each exercise is graded with a number between 0 and 100 and associated with a weight. The final grade for a student on a module is computed as a weighted average of the grades on all assessed exercises (components) obtained during the Term.
Students will pass a module if their final grade is 50 out of 100 or more.
Computing the final grade as the weighted grade on all assessed components allows us to eliminate anomalies such as the following one. If a student gets a low grade (e.g. 20 points) in a component that only has an associated 10% weight in the final grade, but gets high grades on all remaining components, they can still end up with a very good final grade and pass the module. Failing students because their grade on a single assessed component is low (e.g. 20 as in the example) would enable the above described anomaly and related unfair evaluation of students.
Students will also practice with unmarked tests and quizzes. To this end, at the end of specific teaching units, as defined by the Lecturer, students will be able to complete a self-assessment exercise (the estimated time allocated to complete this is indicated on this application form as part of the self study hours).

Students must follow a minimum 70% of all video lessons in order to successfully complete a unit, and this is monitored through the online attendance of the different learning activities. Verification and certification of learning outcomes from the course work is achieved by an automatic online tracking system. The related details are made available to the student for the self-assessment tests.
One of the possible exercises consists of a practical research project. Such projects are intended to get students to test the concepts learnt in class within a real setting thus assisting them to develop their abilities outside of a laboratory setting. The project is an integral part of the curriculum. It is a unique opportunity to carry out independent research in order to devise an innovative solution for a real-world problem. While a project of this scope and scale can be challenging, it can also be very rewarding.

Reassessment:
Should a student fail a module, their current final grade on that module becomes 50% of the final grade, and the reassessment test is worth the remaining 50%. For instance, if a student has a final grade of 40/100, they need to score at least 60/100 on the reassessment test to pass the module with 50/100.

There are two reassessment sessions every academic year. The first one right at the end of the Term, no later than two weeks after the end of the Term. The second one occurs one week before the beginning of the academic year. The reassessment methodology (including the precise dates) will be decided by the Lecturer (e.g. a project assignment that can be completed in a short period of time) and communicated to the students at the beginning of the Term.

Accepting/Rejecting grades:
A student with a passing final grade on a course can still reject the final grade and opt for the reassessment session. The rejected passing grade is still worth 50% according to the reassessment mechanism. For instance, if a student has a passing final grade of 80/100, rejects it and obtains 100/100 in the reassessment session, then their final grade will be 90/100.

Group projects:
In the case of group-based projects, students will be required to specify the contribution of each and every student involved in the project.

Moderation process: The Program Head and Class Coordinator will perform moderation of all exams and related assessed components to ensure the highest standards of quality have been met, to validate the consistency of the marking and feedback process with respect to model answers, and ultimately to support Lecturers and students along the program. If neither the Program Head nor the Class Coordinator are not knowledgeable of a particular area, OPIT will engage external moderators.

Academic Integrity:
Students are required to follow Academic Integrity guidelines defined and maintained by OPIT. The guidelines are shared with students and faculty through our private LMS.

90 ECTS

Hours of Total Learning

1 ECTS is equivalent to 25 total hours of learning, inclusive of contact hours, supervised placement and practice hours, self-study hours and assessment hours.

Total Contact Hours [1] 504 (Contact Hours are hours invested In learning new content under the Direction of a tutor/lecturer (e.g. lectures, participation in online forums, video-lectures)	Supervised Placement and Practice Hours 504 (During these hours the learner is supervised, coached, or mentored. Tutorial hours may be included here)
Self-Study Hours 1107 (Estimated workload of research and study)	Assessment Hours 135 (Examinations/ presentations/ group work/ projects, etc.)
Total Learning Hours	**2250 Hours**

120 ECTS

Hours of Total Learning

1 ECTS is equivalent to 25 total hours of learning, inclusive of contact hours, supervised placement and practice hours, self-study hours and assessment hours.

Total Contact Hours [2] 659 (Contact Hours are hours invested In learning new content under the Direction of a tutor/lecturer (e.g. lectures, participation in online forums, video-lectures)	Supervised Placement and Practice Hours 659 (During these hours the learner is supervised, coached, or mentored. Tutorial hours may be included here)
Self-Study Hours 1547 (Estimated workload of research and study)	Assessment Hours 135 (Examinations/ presentations/ group work/ projects, etc.)
Total Learning Hours	**3000 Hours**

[1] *In the case of online learning, synchronous and asynchronous learning activities under the direction and control of an instructor are considered as contact hours.*
[2] *In the case of online learning, synchronous and asynchronous learning activities under the direction and control of an instructor are considered as contact hours.*

The Program Structure

Module/ Unit Title	Compulsory (C) or Elective (E)	ECTS	MQF Level	Mode of Teaching	Mode of Assessment	Term
Python Programming for Data Science	Compulsory	5	7	Live lectures, asynchronous contents	Exercises, Tests	1
Applied Machine Learning	Compulsory	5	7	Live lectures, asynchronous contents	Exercises, Tests	1
Big Data and Cloud Computing Infrastructure	Compulsory	5	7	Live lectures, asynchronous contents	Exercises, Tests	1
Applied Artificial Intelligence	Compulsory	5	7	Live lectures, asynchronous contents	Exercises, Tests	1
Business Problem Solving	Compulsory	5	7	Live lectures, asynchronous contents	Exercises, Tests	1
Project Management	Compulsory	5	7	Live lectures, asynchronous contents	Exercises, Tests	1
Business Communication	Compulsory	5	7	Live lectures, asynchronous contents	Exercises, Tests	2
Business Applications in Data Science and Artificial Intelligence 1	Compulsory	9	7	Live lectures, asynchronous contents	Exercises, Tests	2
Business Applications in Data Science and Artificial Intelligence 2	Compulsory	9	7	Live lectures, asynchronous contents	Exercises, Tests	2
Research Methods and Tools	Compulsory	3	7	Live lectures, asynchronous contents	Exercises, Tests	2
Ethics and Regulations of Artificial Intelligence	Compulsory	4	7	Live lectures, asynchronous contents	Exercises, Tests	2
Capstone Project and Dissertation - for students completing MSc at 90 ECTS	Compulsory	30	7	-	Project, Dissertation	3
Capstone Project and Dissertation - for students completing MSc at 120 ECTS	Compulsory	60	7	-	Project, Dissertation	3 - 4
Total ECTS for Program Completion		**90/120 ECTS**				

Python Programming for Data Science
Compulsory
5 ECTS
Term 1

Course Description

The Python Programming for Data Science is a basic module that gives students an introduction to the Python programming language with emphasis on functionalities and libraries supporting Data Science projects. More precisely, the module will teach the students how to write and manage programs written in Python using basic native functionalities for manipulating strings and lists, numpy for manipulating vectors and matrices, matplotlib for plotting functionalities.

The module will start with an introduction to the Python programming language, focusing on:

- Python as a language: variables, statements, comments and simple arithmetic operations
- Functions: encapsulation and abstraction; arguments and return values; namespaces and scope
- Sequences and iteration: lists, loops, nested loops, accumulation as a programming idiom
- Flow control: conditional expressions, while loops; searching by bisection and bracketing
- Mutable and immutable variables, and sequences: tuples, lists and strings; associative arrays, hashing and dictionaries
- Larger programs; encapsulation and program organization; input/output and exceptions

Successively, the module will focus on the numpy library, specifically the module will cover:

- Introduction to the numpy library
- Indexing and slicing
- Numpy operations

The module will be based on the use of jupyter notebooks.

Applying Knowledge and Understanding

At the end of the module/unit the learner will have acquired the following skills:

a) Apply principles of good practice to write correct codes
b) Create the documentation of complex programs
c) Use functions to handle errors and make programs usable
d) Prioritize transparency, collaboration, and openness in scientific research
e) Verify data sources and privacy regulations

Module-Specific Learner Skills

At the end of the module/unit the learner will be able to

a) Write complex programs in Python
b) Apply principles of best practice to use Python data structures
c) Produce documentation of Python programs with standard tools

Module-Specific Digital Skills and Competences

At the end of the module/unit, the learner will be able to

a) Interface with existing Python codes

b) Use external libraries, including numpy and matplotlib

c) Demonstrate good command of jupyter notebooks

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Applied Machine Learning
Compulsory
5 ECTS
Term 1

Course Description

The Applied Machine Learning module is designed to deliver an hands-on experience to the students on modern Machine Learning methodologies. Notably, in this module students will look at different Machine Learning models and related learning algorithms that deal with classification, regression, clustering, and visualization tasks. They will learn the core principles and how to use standard frameworks to train, evaluate, and use them with real-world examples. However, the module will focus on examples and use cases with the Python programming language by means of modern libraries widely used in research and industry, including scikit-learn, keras and tensorflow.

The topics covered in the module include:

- Data pre-processing and validation
- Training paradigms in machine learning
- Support vector machines
- Dimensionality reduction and manifold learning
- Clustering
- Multilayer perceptrons
- Convolutional neural networks
- Recurrent neural networks

The module will stress the use of jupyter notebooks for developing code and reporting results.

Applying Knowledge and Understanding

At the end of the module/unit the learner will have acquired the following skills:

a) Hands-on experience on learning solutions to deal with specific applications
b) Create advanced pipelines using machine learning algorithms
c) Use Python to program and analyze different datasets
d) Use machine learning libraries to analyze the data and extract insights describing the underlying datasets
e) Use scikit-learn, keras, and tensorflow
f) Apply the lessons learnt to predict real-world phenomena
g) Prepare data elements for further analysis
h) Prioritize transparency, collaboration, and openness in scientific research
i) Verify data sources and privacy regulations

Module-Specific Learner Skills

At the end of the module/unit the learner will be able to

a) Explain how Machine Learning methods manage to extract interesting features from existing datasets
b) Plan the organization and functionalities in scikit-learn and keras
c) Monitor new technologies being adopted as part of the data science domain

Module-Specific Digital Skills and Competences

At the end of the module/unit, the learner will be able to

a) Use Machine Learning tools such as scikit-learn and keras

b) Analyze data and make predictions using datasets of various kind

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Big Data and Cloud Computing Infrastructure
Compulsory
5 ECTS
Term 1

Course Description

The Big Data and Cloud Computing Infrastructure is a first introduction to the problem of managing and computing with large volumes of data. The module aims to help students understand the growing needs in computing resources (big data problem) and how they can be addressed using modern cloud computing architectures. The module will highlight the fundamental concepts behind clouds (such as virtualization, Infrastructure as a Service, Platform as a Service, Hybrid Models, and others) in relation to alternate distributed computing paradigms (such as Peer to Peer networks, Grid computing, and others). This will ensure that students decide on the best computing paradigm they should adopt when solving real-world applications.

The systems available for cloud computing are various and change according to the context. Because of this, the module will introduce different technologies developed by the major players, such as Amazon EC2, Microsoft Azure, Google App Engine, Apache Hadoop, and others. Through this practical approach, they will understand the core principles and concepts surrounding the various architectures (including but not limited to Hybrid Multicloud, Serverless, Microservices, Cloud Natives, etc.).

The module favors a conceptual characterization of common cloud infrastructures and how they might be applied to manage big data. However, the second part of the module also delves into some of the practicalities of setting up a real cloud environment using the leading cloud service providers as a case study, such as movies recommender systems like Netflix. They will also be exposed to traditional cloud functions such as data storage, configuration management, automation, big data processing (using Docker), NoSQL systems, and stream processing.

Finally, an overview of the business implications of using a cloud system will be covered, thus allowing students to gain a macro perspective on using the cloud within larger organizations. Since the dependency on the cloud is constantly increasing, this skill set will be essential in the coming years.

Applying Knowledge and Understanding At the end of the module/unit the learner will have acquired the following skills: a) Plan and setup analytical tasks that can be used with Cloud technologies b) Design a system which uses the Map-Reduce Paradigm c) Prepare financial budgets (pertaining to cloud expenses) that allow business owners to make smart decisions d) Compose security, performance and scalability plans using the latest Cloud technologies e) Prioritize transparency, collaboration, and openness in scientific research f) Verify data sources and privacy regulations
Module-Specific Learner Skills At the end of the module/unit the learner will be able to a) Explain how an cloud system works b) Describe the functions of the various components in a cloud architecture c) Design and propose a basic cloud system
Module-Specific Digital Skills and Competences At the end of the module/unit, the learner will be able to a) Apply the techniques learnt to design a cloud system capable of handling big data b) Setup industry standard platforms such as Google Cloud, Microsoft Azure or Amazon Web Services

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Applied Artificial Intelligence
Compulsory
5 ECTS
Term 1

Course Description

Artificial Intelligence (AI) is the field of study which aims to get machines to do things that humans do best. It is probably the most important technology of the decade and because of this, students need to understand what it is and how to use it. The Applied AI module introduces students to the fundamental concepts of AI, however it does so by focusing on a wide range of topics so as to give the students a taste of theoretical aspects but ultimately focus on the practical viewpoints and tools used in applications.

The module covers a range of topics, including:

- The difference between classical and modern AI
- Reinforcement learning
- Fuzzy logic
- Evolutionary computation
- Overview on main AI applications, including:
- Generative Models
- Natural Language Processing
- Computer Vision
- Modern AI software tools used in applications

By the end of the module, students will be in a better position to understand when and how to use AI tools in applications.

Applying Knowledge and Understanding

At the end of the module/unit the learner will have acquired the following skills:

a) Evaluate different approaches and choose the best one
b) Represent real-world information using different knowledge representation techniques
c) Use any AI technique covered in the module to solve simple challenges
d) Plan and execute a project which uses various aspects of AI
e) Identify ethical issues which might arise from AI projects
f) Prepare conceptual solutions for different AI applications
g) Prioritize transparency, collaboration, and openness in scientific research
h) Verify data sources and privacy regulations

Module-Specific Learner Skills

At the end of the module/unit the learner will be able to

a) Explain how AI approaches work
b) Describe the difference between AI and other subfields of computing

Module-Specific Digital Skills and Competences

At the end of the module/unit, the learner will be able to

a) Design and propose a simple AI system using available technologies

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Business Problem Solving
Compulsory
5 ECTS
Term 1

Course Description

Today, most of the organizations in virtually every industry generate a huge quantity of data, most of which is unstructured and not immediately interpretable. The capability to generate meaningful information, extrapolate insights and then make them available to stakeholders in order for them to make informed decisions, create better products, improve operations and measure results, is what ultimately allows us to make progress and grow.

However, most organizations struggle to do so. Field experts without a tech background typically find it hard to read and analyze data due to little to none data-related technical knowledge. Conversely, most people with a technical background (e.g. Data Science) do not know how to use the insights gathered from the analysis due to little domain knowledge.

The Business Problem Solving module teaches how to fill this gap between decision making and technical units, training the students to function as intermediaries between the two worlds. The module will first introduce the field of data-driven decision-making, i.e. how to use data to guide strategic decisions to reach goals and objectives. To this end, the students will be exposed to the main steps involving data-driven decision making in business: 1) know the goals, 2) identify reliable data sources, 3) clean and organize data, 4) perform analysis, 5) draw conclusions. Accordingly, the module will stress the importance of sharing relevant information, making it continuously accessible across different organizational levels, from business analysts to human resource managers. Finally, the module will go over practical case studies to connect decision making with modern data science and AI tools.

Applying Knowledge and Understanding

At the end of the module/unit the learner will have acquired the following skills:

a) Design complex business processes using data
b) Demonstrate the feasibility of Data Science and AI projects
c) Prioritize transparency, collaboration, and openness in scientific research
d) Verify data sources and privacy regulations

Module-Specific Learner Skills

At the end of the module/unit the learner will be able to

a) Apply principles of best practice to deploy data-driven decisions making strategies
b) Function as intermediary between decision making and data science units

Module-Specific Digital Skills and Competences

At the end of the module/unit, the learner will be able to

a) Use presentation tools such as Powerpoint

b) Use text editors and word processing tools

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Project Management
Compulsory
5 ECTS
Term 1

Course Description

The Project Management and Quality Assurance module starts by giving students an overview of different projects and their backgrounds. This is meant to showcase a hands-on approach to project management. The unit will then delve into identifying the various project components and categorize them into types, followed by a discussion on the organization's culture and how this affects the successful completion or otherwise of a project. In the end, every project manager seeks to complete a project successfully, and to do so; the module will investigate common risks or pitfalls that projects encounter. To help manage the project, we will also explore the use of different methodologies (such as but not limited to PRINCE2).

Once the overarching objectives of Project Management are explained, the student will delve into more granular details. They will have to identify the project boundaries, ensure the necessary resources are available and organize them for efficient implementation. They must clearly define the project's scope and produce a work breakdown to do so. The project's structure has to be clear by defining a governance and organizational set-up that will see the project through the various hurdles. Project reporting should be in place throughout the project based on the expected milestones. To ensure that project costs do not spiral out of control, resources should be adequately estimated, and a responsibility chart should be drawn to ensure everyone is aligned with the project's objectives.

Finally, the crux of all the planning lies in the execution, which has to be carried out effectively and efficiently. Students need to set up robust processes to make sure that they reach these goals, such as work approvals, allocation of resources, team management, progress measurement, forecasting, and project completion amongst others. Almost all projects exhibit some sort of variance, and because of this, they need to engineer recovery actions directly in the plan thus guaranteeing that the project goals are reached. The students will also be exposed to project management information systems which will help them manage very large and international projects.

Applying Knowledge and Understanding At the end of the module/unit the learner will have acquired the following skills: a) Apply the theoretical elements of project management to real-life scenarios b) Use project management techniques to ensure an effective governance and organizational set-up c) Ascertain the principles of accountability and competency through the use of rigorous project management methodologies d) Create detailed project management plans taking into consideration every aspect e) Compose calculated recovery action plans in order to tackle variances which might arise f) Prioritize transparency, collaboration, and openness in scientific research g) Verify data sources and privacy regulations
Module-Specific Learner Skills At the end of the module/unit the learner will be able to a) Explain how project management works and apply it in different contexts b) Describe the complex functions of project management and quality assurance methodologies c) Design basic project management plans
Module-Specific Digital Skills and Competences At the end of the module/unit, the learner will be able to a) Describe how to use project management tools

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Business Communication
Compulsory
5 ECTS
Term 2

Course Description

Business Communication can be loosely defined as the process of sharing information between organizations that cooperate to reach a common goal. This process is fundamental not only for a functioning internal communication, but also to achieve smooth and effective communications between different organizations. Effective business communication is essential for the success and growth of every organization. Unlike everyday communications, business communication is always goal-oriented.
The module will prepare the students to deliver clear and impactful (oral and written) presentations for reporting activities, defining business plans and objectives, and for discussing technical results to a not-necessarily technical audience. The various types of business communication media are covered. This module also develops an awareness of the importance of succinct written expression to modern business communication.

The module will be organized as follows:

- Initially, the students will understand the need for impactful and effective communication, and how communication shapes society and the complex world around us;
- The, the module will focus on how to write for business audiences, how to improve writing techniques, and on how to revise and proofread business messages;
- Then, the students will be exposed to different types of prototypical messages: negative messages, persuasive messages, routine and goodwill messages.
- Finally, the focus will be on writing reports and proposals, and on how to deliver effective presentations

Applying Knowledge and Understanding

At the end of the module/unit the learner will have acquired the following skills:

a) Communicate clearly, effectively and goal-oriented
b) Write business messages and reports
c) Prioritize transparency, collaboration, and openness in scientific research
d) Verify data sources and privacy regulations

Module-Specific Learner Skills

At the end of the module/unit the learner will be able to

a) Develop interpersonal skills that contribute to effective communication

Module-Specific Digital Skills and Competences

At the end of the module/unit, the learner will be able to

a) Use presentation tools such as Powerpoint

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Business Applications in Data Science and Artificial Intelligence 1 / 2
Compulsory
9 ECTS / 9 ECTS
Term 2

Course Description

The modules will expose students to applications of Data Science and Artificial Intelligence (AI) tools in various domains, such as Energy and Climate, Healthcare, Finance and Banking, Sports, Media and Entertainment. The module will delve into one or more case studies involving real-world applications of Data Science and AI tools presented by leading academic/industrial figures. The modules are taught by field experts, as such it will give the students a detailed overview of the problems and decision making strategies involved in the process of collecting data, understanding the data, and analyzing the insights obtained from the analysis with various tools. As part of their training, the students are also expected to practice with real-world data on tasks assigned by the Lecturers.

Applying Knowledge and Understanding

At the end of the modules/units the learner will have acquired the following skills:

a) Hands-on experience on learning solutions to deal with specific applications
b) Investigate advanced Data Science and AI pipelines
c) Use common Data Science and AI libraries to analyze data and extract insights describing the underlying processes
d) Apply the lessons learnt to predict real-world phenomena
e) Prioritize transparency, collaboration, and openness in scientific research
f) Verify data sources and privacy regulations

Module-Specific Learner Skills

At the end of the modules/units the learner will be able to

a) Use Data Science methods to explore existing datasets
b) Describe the organization of different data types
c) Monitor new technologies being adopted as part of existing software pipelines

Module-Specific Digital Skills and Competences

At the end of the modules/units, the learner will be able to

a) Use modern Data Science and AI tools like scikit-learn and keras
b) Make predictions using real-world datasets
c) Create reports, presentations, and describe technical results

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Research Methods and Tools
Compulsory
3 ECTS
Term 2

Course Description

This Module consists of a number of lectures and seminars intended to provide students with an understanding of research methodologies required, and tools available, to undertake research in computer science. The module will offer guidance on how to undertake literature reviews, how to plan a research project, how to collect, process and analyze data, both quantitative and qualitative, and how to use appropriate conventions to write up research reports and a graduate-level thesis.

Applying Knowledge and Understanding

At the end of the module/unit the learner will have acquired the following skills:

a) Plan a research assignment, including the formulation of a research question, the development of a proposal or hypothesis, and the design of a process to test such hypothesis
b) Use electronic library resources
c) Design a sampling programme, an interview or a questionnaire
d) Analyze research results, quantitatively or qualitatively as appropriate
e) Write research reports clearly, in a style appropriate to purpose and in accordance with accepted standards
f) Know how to properly reference existing literature
g) Prioritize transparency, collaboration, and openness in scientific research
h) Verify data sources and privacy regulations

Module-Specific Learner Skills

At the end of the module/unit the learner will be able to

a) Undertake a literature review, and handle and critically evaluate sources, as well as properly reference such sources
b) Use appropriate tools to optimize the creation of research documents, and the presentation of research results
c) Determine what is expected from an MSc dissertation

Module-Specific Digital Skills and Competences

At the end of the module/unit, the learner will be able to

a) Use presentation tools such as Powerpoint

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Ethics and Regulations of Artificial Intelligence
Compulsory
4 ECTS
Term 2

Course Description

The Ethics and Regulations of Artificial Intelligence (AI) module explores the various implications of AI technologies developed by practitioners. This module will introduce students to the fundamental ethical theories and frameworks used to analyze and evaluate the ethical implications of relevant AI technologies. It will provide opportunities for students to apply these theories and frameworks to real-world scenarios involving AI.

Students can explore various ethical issues throughout the module, including privacy, bias, fairness, transparency, accountability, and autonomy. They will learn how to identify and analyze ethical dilemmas that may arise in developing these technologies and the potential solutions available.

In addition to discussions and lectures, this course will include various hands-on activities and case studies that will allow students to apply their knowledge of ethical theories and frameworks to real-world scenarios. For example, students may work in teams to analyze and evaluate the ethical implications of a new AI system being developed by a tech company. They may also explore the potential consequences of a proposed policy related to using personal data by technology firms.
By the end of the course, students will have a deep understanding of the ethical and societal implications of AI. They will be prepared to apply their knowledge to various real-world scenarios while having the skills and confidence to engage in informed and productive discussions about the ethical issues surrounding these technologies.

Some of the specific topics that may be covered in this course include:

- The role of ethics in AI
- Fundamental ethical theories and frameworks, such as utilitarianism, deontology, and virtue ethics
- Ethical issues related to privacy, bias, fairness, transparency, accountability, and autonomy
- Approaches to identifying and analyzing ethical dilemmas in AI
- Strategies for addressing ethical dilemmas and mitigating potential negative consequences
- The AI act
- Case studies and hands-on activities involving real-world scenarios involving AI

This course is designed to provide students with a comprehensive introduction to AI ethics. Through a combination of lectures, discussions, and hands-on activities, students will gain a deep understanding of the ethical and societal implications of these technologies. They will be prepared to apply their knowledge to various real-world scenarios.

Applying Knowledge and Understanding

At the end of the module/unit the learner will have acquired the following skills:

a) Practice ethics audits on AI case studies while considering the ethical implications of the technologies involved
b) Demonstrate the ethical dilemmas that may arise in the development and use of these technologies
c) Apply ethical theories and frameworks to real-world scenarios involving privacy, bias, fairness, transparency, accountability, and autonomy
d) Develop strategies for addressing ethical dilemmas and mitigating potential negative consequences of software systems
e) Engage in informed and productive discussions about the ethical issues surrounding software projects
f) Apply knowledge and skills learned in this course to real-world scenarios
g) Conduct AI audits on existent projects
h) Create a plan of action to ensure that software projects take into consideration the ethical implications
i) Prioritize transparency, collaboration, and openness in scientific research
j) Verify data sources and privacy regulations

Module-Specific Learner Skills

At the end of the module/unit the learner will be able to

a) Explain the different ethical issues that might arise in AI systems
b) Define how to track ethical issues and mitigate them
c) Design structure plans to ensure that all the ethical implications are taken into consideration

Module-Specific Digital Skills and Competences

At the end of the module/unit, the learner will be able to

a) N/A

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Capstone Project and Dissertation - for students completing MSc at 90 ECTS
Compulsory
30 ECTS
Term 3

Course Description

The MSc Thesis is the most significant single project assigned to students throughout their MSc program. It is intended to consolidate the skills gained during the MSc program through a term-long research project. Each student, together with an assigned OPIT supervisor, will work on a project proposal that will then be realized through the last term of the MSc program. The MSc Thesis must deal with a real-world case study involving Data Science / AI methods applied to relevant application domains (such as Energy, Finance, Sports Science etc). The application domain is not necessarily limited to the ones discussed during the program. Students will also have the opportunity to conduct internships with industrial partners as a way to work and complete their MSc thesis.

The thesis is the longest and most challenging project assigned to a student, requiring an entire term of preparation and hard work. The supervisor's role is to guide the student since most of the project should be carried on as an independent work. Students are required to prepare a thesis where they will describe the project goals and the obtained results. The results should provide enough depth within a particular field of application and be consistent with the original plan agreed with the supervisor. Although at this level one does not expect novelty, innovation distinguishes between an excellent and good thesis. At the end of the process, the student would have learnt to conduct independent research, problem-solving, numerical mastery, project management, time management, and self-discipline, amongst others.

The thesis will be presented to a committee, composed of an internal examiner, an external examiner, and the supervisor, where the student will be expected to defend the work done, and the results presented. This happens typically via an oral examination called a viva, where the student presents their work and answers questions from the committee.

The final MSc thesis manuscript should consist of 10,000 - 15,000 words.

Applying Knowledge and Understanding

At the end of the module/unit the learner will have acquired the following skills:

a) Learn how to construct a comprehensive literature review
b) Provide a solution to a particular problem, putting it in a specific application domain
c) Articulate the criteria that describe the adequacy of a solution, design and develop a solution using Machine Learning and Data Science tools
d) Assess the solution with respect to the identified criteria
e) Produce a well-structured report describing and scientifically substantiating the approaches, concepts and techniques used and the results obtained
f) Practice the use of core soft-skills such as time-management, project-management, presentation and communication skills

Module-Specific Learner Skills At the end of the module/unit the learner will be able to a) Apply to major situational contexts formal and informal knowledge b) Apply the knowledge and methods acquired during the course of studies to different application domains c) Make use of different modes of communication, according to the different contexts in which students are exposed
Module-Specific Digital Skills and Competences At the end of the module/unit, the learner will be able to a) Perform extensive online searches through various digital repositories b) Analyze data and produce results using the Data Science libraries discussed during the program and beyond c) Use digital presentation tools such as Powerpoint

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Capstone Project and Dissertation - for students completing MSc at 120 ECTS

Compulsory

60 ECTS

Term 3 - 4

Course Description

The MSc Thesis is the most significant single project assigned to students throughout their MSc program. It is intended to consolidate the skills gained during the MSc program through a term-long research project. Each student, together with an assigned OPIT supervisor, will work on a project proposal that will then be realized through the last term of the MSc program. The MSc Thesis must deal with a real-world case study involving Data Science / AI methods applied to relevant application domains (such as Energy, Finance, Sports Science etc). The application domain is not necessarily limited to the ones discussed during the program. Students will also have the opportunity to conduct internships with industrial partners as a way to work and complete their MSc thesis.

The thesis is the longest and most challenging project assigned to a student, requiring an entire term of preparation and hard work. The supervisor's role is to guide the student since most of the project should be carried on as an independent work. Students are required to prepare a thesis where they will describe the project goals and the obtained results. The results should provide enough depth within a particular field of application and be consistent with the original plan agreed with the supervisor. Although at this level one does not expect novelty, innovation distinguishes between an excellent and good thesis. At the end of the process, the student would have learnt to conduct independent research, problem-solving, numerical mastery, project management, time management, and self-discipline, amongst others.

The thesis will be presented to a committee, composed of an internal examiner, an external examiner, and the supervisor, where the student will be expected to defend the work done, and the results presented. This happens typically via an oral examination called a viva, where the student presents their work and answers questions from the committee.

The final thesis manuscript should consist of 15,000 - 30,000 words.

The module instance described here is worth 60 ECTS. The main differences between a 30 and a 60 ECTS Capstone Project and Dissertation are the duration and the value of the results reached by the students. Students opting for the 60 ECTS version will be required to work two full Terms (instead of one) on the module and will be expected to produce results that are publishable in relevant journals and/or conference proceedings. On the other hand, students working on the 30 ECTS version are not expected to reach that level of quality at the time of graduation.

Applying Knowledge and Understanding At the end of the module/unit the learner will have acquired the following skills: a) Learn how to construct a comprehensive literature review b) Provide a solution to a particular problem, putting it in a specific application domain c) Articulate the criteria that describe the adequacy of a solution, design and develop a solution using Machine Learning and Data Science tools d) Assess the solution with respect to the identified criteria e) Produce a well-structured report describing and scientifically substantiating the approaches, concepts and techniques used and the results obtained f) Practice the use of core soft-skills such as time-management, project-management, presentation and communication skills
Module-Specific Learner Skills At the end of the module/unit the learner will be able to a) Apply to major situational contexts formal and informal knowledge b) Apply the knowledge and methods acquired during the course of studies to different application domains c) Make use of different modes of communication, according to the different contexts in which students are exposed
Module-Specific Digital Skills and Competences At the end of the module/unit, the learner will be able to a) Perform extensive online searches through various digital repositories b) Analyze data and produce results using the Data Science libraries discussed during the program and beyond c) Use digital presentation tools such as Powerpoint

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