SDAIA
الهيئة السعودية للبيانات والذكاء الاصطناعي
Saudi Data & AI Authority

Saudi Academic Framework for AI Qualifications (Education Intelligence) 2023 - 2024

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Saudi Academic Framework for AI Qualifications

(Education Intelligence)

2023 - 2024

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Acknowledgments

we extend our profound gratitude to all those who contributed to the preparation of this momentous document that outlines the qualifications in the field of artificial intelligence. This includes those who proposed the project, those who enriched the working team with essential information through focus groups or supporting documents, and the supporting entities that adopted this document and put it into effect.

Saudi Data & AI Authority

Executive Summary

The Saudi Academic Framework for AI Qualifications Project, undertaken by the Saudi Data & AI Authority (SDAIA), serves as a comprehensive guide for the development, evaluation, and accreditation of higher education programs in artificial intelligence (AI). This document constitutes a trusted and recognized reference for AI education in the Kingdom of Saudi Arabia.

The development of this framework meticulously considered recognized scientific methodologies. An integrated approach was adopted, combining descriptive, historical, and future-predictive methodologies in this rapidly evolving field. Flexibility and adaptability were prioritized to ensure the framework's alignment with this dynamic landscape, empowering educational and training institutions to foster innovation and continuous development.

The framework focuses on the specifications and quality assurance of curricula for academic and training programs in AI. Moreover, it outlines the AI qualifications granted in the Kingdom of Saudi Arabia based on global benchmarks, elaborating on the general learning outcomes for graduates of each of these qualifications.

This framework is comprised of four core chapters:

First: Benchmarks: This chapter is divided into two sections:

1. Specialized Frameworks in the Kingdom of Saudi Arabia: This section provides an overview and summary of the frameworks available in the Kingdom of Saudi Arabia that are relevant to the Saudi Framework for AI Qualifications.
2. Local and International Benchmarks: This section provides an overview of a number of prestigious educational and training institutions worldwide.

Second: AI Qualifications in the Kingdom of Saudi Arabia: This chapter reviews the qualifications and certifications awarded in the Kingdom of Saudi Arabia in accordance with the National Qualifications Framework (**NQF**) and the Saudi Standard Classification of Educational Levels and Specializations.

Third: Learning Outcomes for Each Qualification: For each educational qualification, general learning outcomes have been established based on the specific learning domains outlined in the National Qualifications Framework, with consideration for the progressive nature of qualification levels.

Fourth: Knowledge Units for Each Qualification: This chapter outlines the knowledge as well as core and elective subjects offered within each AI qualification. It is based on benchmarking practices within and outside the Kingdom, ensuring flexibility and adaptability in light of the anticipated rapid advancements in AI fields.

Methodology in Preparing the Saudi Academic Framework for AI Qualifications

An integrated approach was adopted in developing this framework, utilizing a combination of methodologies, including descriptive, analytical, and inductive approaches, to ensure precise and aligned outcomes with national plans and global trends. The following procedures were followed:

- Analyze future trends and Vision 2030 programs related to AI.
- Investigate the qualifications and certifications currently offered in Saudi Arabia.
- Identify the key themes to be covered by the framework.
- Conduct an in-depth analysis of each key theme.
- Conduct global benchmark analyses for each key theme.
- Review existing frameworks in Saudi Arabia, such as the National Qualifications Framework, Saudi Standard Classification of Educational Levels and Specializations, and Saudi Standard Classification of Occupations.
- Develop an initial conception for each key theme.
- Discuss proposals with stakeholders and beneficiaries through workshops.
- Curate and Integrate the key themes.
- Finalize the Saudi Academic Framework for AI Qualifications.

Methodology in Preparing the Saudi Academic Framework for AI Qualifications (Education Intelligence)

Review existing frameworks in the Kingdom of Saudi Arabia

Conduct global benchmark analyses for each key theme

Conduct an in depth analysis of each key theme

Identify the key themes to be covered by the framework

Investigate the qualifications and certifications currently offered in Saudi Arabia

Analyze future trends and Vision 2030 programs related to AI

Terminology

Qualification:

A collection of learning outcomes encompassing knowledge, skills, values, and attributes acquired by a learner. It is issued in the form of a document (certificate, diploma, or degree) by a recognized educational or training institution as a recognized granting body.

National Qualifications Framework:

A comprehensive and unified system for placing, designing, developing, and recognizing all academic qualifications in the Kingdom of Saudi Arabia.

Scope of the Saudi Academic Framework for AI Qualifications:

A comprehensive and unified system for placing, designing, developing, and recognizing the qualifications of AI specializations in the Kingdom of Saudi Arabia.

Qualification Placement:

Mapping of qualifications issued by recognized national or international education and training granting bodies to the corresponding levels of the National Qualifications Framework.

Credit Hours:

The learning time required to earn the qualification; it is measured in the number of actual hours necessary to achieve the qualification's learning outcomes (one credit hour is no less than 50 minutes over 15 weeks or its equivalent).

Learning Domains:

Comprising the knowledge, understanding, skills, values, and attributes that a learner is expected to acquire at a specific qualification level. Learning outcomes are constructed in light of these domains.

Learning Outcomes:

The specific knowledge, skills, and behaviors that a learner is expected to acquire and demonstrate in the learning or work domain. They represent the culmination of the learning process.

Levels of the National Qualifications Framework:

There are eight levels for the qualification placement of public education, technical and vocational training, and higher education sectors: academic, applied, civil research, and military.

Qualification Alignment:

Mapping of qualifications issued by accredited educational or training institutions in the Kingdom of Saudi Arabia to the corresponding levels of the National Qualifications Framework.

Objectives of the Saudi Academic Framework for AI Qualifications

As SDAIA is the authorized entity to establish a framework that defines the recognized qualifications in the Kingdom of Saudi Arabia, it has identified the following objectives for this document:

1. Serve as a guideline for the development, evaluation, and accreditation of higher education programs in AI.
2. Contribute to establishing minimum curricular requirements for higher education programs in the field of AI.

Scope of the Saudi Academic Framework for AI Qualifications

This framework encompasses post-secondary educational programs in AI specializations, including:

- Associate Degree
- Bachelor's Degree
- Master's Degree
- Intermediate and Advanced Diplomas
- Higher Diploma
- Doctor of Philosophy (PhD)

Given the rapid development in this field, the framework addresses the knowledge units required in this specialization with a degree of generality. This provides educational institutions with the required flexibility to make the necessary changes to their curricula to keep pace with global developments in this field.

This framework can be applied to educational programs and academic degrees in AI specializations offered by public and private post-secondary educational institutions in the Kingdom of Saudi Arabia. This framework encompasses AI educational programs in general without delving into specialized programs in subfields of AI.

Chapter One:

Benchmarks

1. Specialized Frameworks in the Kingdom of Saudi Arabia

A. National Qualifications Framework

The 2020 edition of the National Qualifications Framework serves as the overarching reference for all qualifications granted by educational institutions upon completion of academic programs. This framework delves into the nature, types, and progressive levels of qualifications, specifying the credit hours associated with each qualification and the required learning outcomes for each qualification level. It represents a comprehensive and unified system for developing, organizing, and placing qualifications at various levels based on learning outcomes. It provides a common language and a scientific benchmark while also serving as an instrument to facilitate the transfer of knowledge, skills, and values across diverse work environments at both national and international levels. The framework aims to establish an integrated system that ensures a high standard of quality, competitiveness, and international recognition for national qualifications.

- **Levels:** The framework defines 8 levels of qualifications, from the Elementary Level (Level 1) to the Doctoral Level (Level 8).
- **Credit Hours:** The framework has specified the minimum number of credit hours for each qualification in accordance with global standards.
- **Learning Outcomes:** Three main learning domains have been identified: knowledge, comprehension, skills, values, independence, and responsibility.

B. Saudi Standard Classification of Educational Levels and Specializations (Ministry of Education)

This classification describes and classifies educational specializations, fields, and levels available to individuals throughout their lives. It encompasses a diverse range of planned educational programs within the national context at the following levels: elementary, intermediate, secondary, post-secondary non-higher education, higher education, various training programs, adult literacy and education programs, continuing education, e-learning, technical and vocational education, special education, provided that the individual has obtained an educational qualification recognized by the relevant authorities. The classification includes all forms of education (systemic and non-systemic) as long as participants are awarded a certified and recognized certificate or document approved by the official competent authorities in the Kingdom and meets the minimum standards for program admission and completion, as specified in the guideline's classification criteria. This classification framework has been designed to facilitate its application in a variety of areas, including:

- Education planning and development.
- Educational and vocational planning for learners.
- Employment and labor market development.
- Education statistics.

C. Saudi Standard Classification of Occupations (Ministry of Human Resources and Social Development)

The Council of Ministers Resolution No. (660) dated 24/10/1441 AH was issued approving the implementation of the Saudi Standard Classification of Occupations. This classification is based on the International Standard Classification of Occupations (ISCO_08) issued by the United Nations Economic and Social Council. It includes the classification and collection of occupational information obtained through censuses and surveys. It is a system for identifying, classifying, and organizing job titles and occupations into hierarchical occupational matrices. It serves as a reference for recruitment agencies, providing local, regional, or international occupation coding and descriptions to enable local, regional, and international data comparisons. It also identifies all occupations in the Saudi labor market and facilitates the processing of its data. The classification identifies the following occupations for Bachelor's graduates in AI fields:

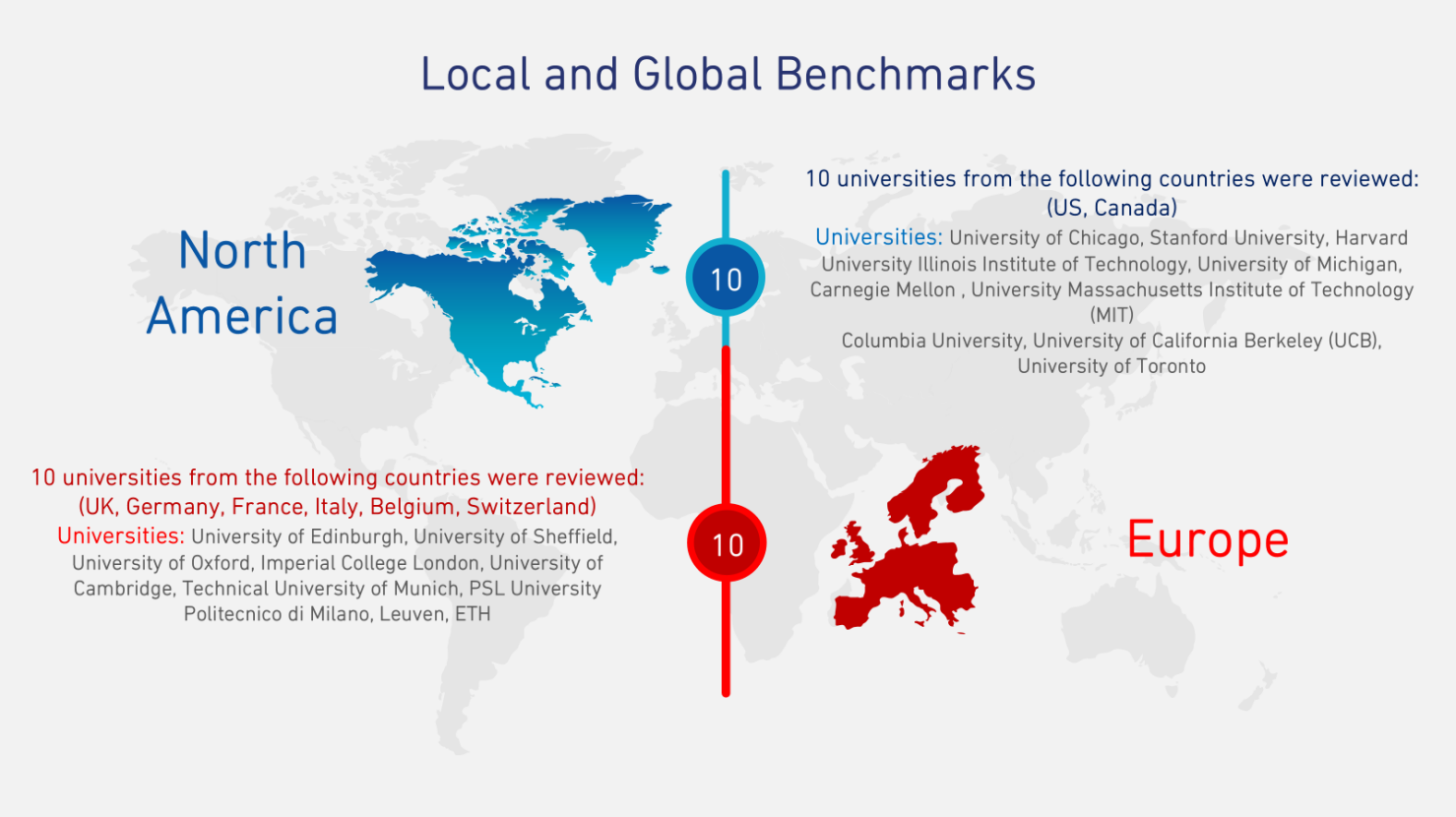
- 252902 AI Specialist
- 252905 Cybersecurity AI Specialist

We were unable to identify specific classifications for Diploma holders, including Associate, Technical, and Higher Diplomas, nor for Master's Degrees.

D. Digital Skills Framework based on SFIA 7

The framework identifies 102 skills employed in the communications and information technology industry. These skills represent a culmination of experiences from hundreds of companies and organizations operating in the sector worldwide. The framework is experience-based, enabling individuals to demonstrate proficiency in a particular competency across seven progressive skill levels, ranging from the lowest to the highest. This framework differs from qualification-based frameworks as it does not specify job titles or designations. The skills identified by the framework in the field of AI can be aligned with the National Qualifications Framework and referred to when formulating learning outcomes for qualifications.

2. Local and International Benchmarks:



Local and Global Benchmarks

Asia

14

14 universities from the following countries were reviewed:
(Saudi Arabia, India, China
South Korea, Singapore, Hong Kong, Japan)
Universities: King Saud University,
Princess Nourah Bint Abdulrahman University
Imam Abdulrahman Bin Faisal University, King Abdulaziz University, King Fahd University of Petroleum and Minerals, Indian Institute of Science, The Hong Kong Polytechnic University, Chinese University of Hong Kong, Tsinghua University, Seoul National University
Korea Advanced Institute of Science & Technology (KAIST), Nanyang Technological University, Hong Kong University of Science and Technology, University of Tokyo

Two universities from the following country were reviewed:
(Australia)
Universities: Deakin University, University of Melbourne

2

Australia

Chapter Two:

AI Qualifications in the Kingdom of Saudi Arabia

AI Qualifications in the Kingdom of Saudi Arabia

Associate Diploma Qualification

Admission Requirements

- Secondary school diploma or equivalent
- Equivalent diploma in any applied sciences field
- Must meet the minimum English language admission requirements (IELTS 5.5 or TOEFL 550)

Saudi Standard Classification	Qualification level according to NQF
061901	Fourth

Intermediate / Advanced Diploma Qualification

Admission Requirements

- Technical diploma in any field
- Must meet the minimum English language admission requirements (IELTS 5.5 or TOEFL 550)

Saudi Standard Classification	Qualification level according to NQF
061901	Fifth

Bachelor's Degree (AI)

Admission Requirements
- Secondary school diploma or equivalent

Saudi Standard Classification	Qualification level according to NQF
061901	Sixth

Bachelor's Degree (Computer Science AI Track)

Admission Requirements
- Secondary school diploma or equivalent

Saudi Standard Classification	Qualification level according to NQF
061901	Sixth

Bachelor's Degree (Information Technology AI Track)

Admission Requirements
- Secondary school diploma or equivalent

Saudi Standard Classification	Qualification level according to NQF
061901	Sixth

Higher Diploma Qualification (Specialists)

Admission Requirements
- Secondary school diploma or equivalent

Saudi Standard Classification	Qualification level according to NQF
061901	Sixth

Higher Diploma Qualification (Non-Specialists)

Admission Requirements
- Secondary school diploma or equivalent

Saudi Standard Classification	Qualification level according to NQF
061901	Sixth

Master's Qualification

Admission Requirements

- Bachelor's Degree in Computer Science or related fields, in addition to Engineering, Physics, Mathematics, and Statistics. The student should complete a set of supplementary courses as determined by the department.

Saudi Standard Classification	Qualification level according to NQF
061901	Seventh

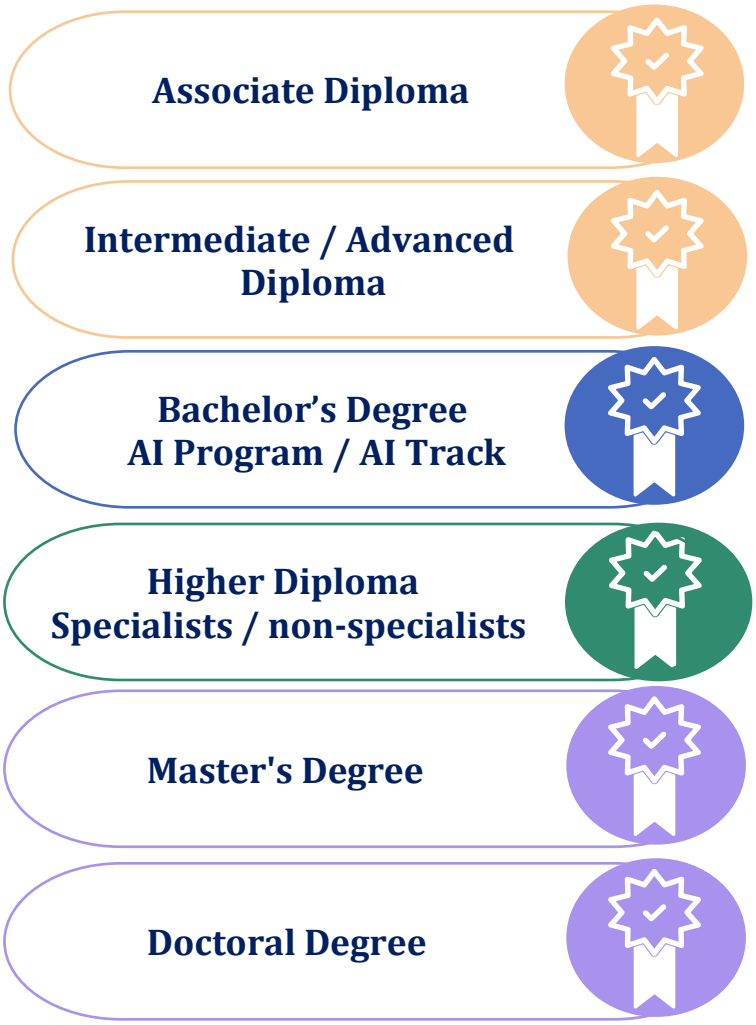
Doctoral Qualification

Admission Requirements

- Master's Degree in Computer Science or related fields, in addition to Engineering, Physics, Mathematics, and Statistics. The student should complete a set of supplementary courses as determined by the department.

Saudi Standard Classification	Qualification level according to NQF
061901	Eighth

Qualification Titles within the Framework:



Chapter Three:

Learning Outcomes for Each Qualification

1. Associate Diploma

General learning outcomes for Associate's Degree programs in AI.

Knowledge

Graduates should be able to demonstrate knowledge of:

- A limited set of concepts, principles, and theories in mathematics, statistics, and computer science, with some theoretical and technical depth in one or more areas of AI.
- A limited set of knowledge and understanding of the processes, algorithms, techniques, and tools associated with the field.
- A limited set of knowledge in one of the fundamental branches of AI, including research methodologies and methods as well as semi-guided inquiry techniques.

Skills

Graduates should be able to:

Cognitive Skills:

- Apply relevant AI theories and principles, machine learning algorithms, and mathematical models and adapt them to specific and novel contexts.
- Analyze moderately complex and novel problems and issues, as well as apply, develop, and implement relevant AI models and systems, machine learning algorithms, and mathematical models to find solutions.
- Employ critical thinking to provide innovative and effective solutions to programming problems, automate processes, develop intelligent decision support systems, and simulate real-world scenarios in moderately complex and novel contexts.
- Conduct research or inquiries into novel issues and problems.

Skills

Communication and Information Technology Skills:

- Effective verbal communication to present AI solutions and results, and to convey and interpret findings to both specialists and non-specialists.
- Effective written communication to convey ideas or information, utilizing data and dictionaries.
- Utilize and interpret moderately complex and novel numerical data and graphical representations in the field of AI.

Values, Responsibility, and Autonomy

Within moderately complex and novel contexts, graduates should be able to:

- Demonstrate awareness of the AI professional's code of ethics and exhibit responsible citizenship.
- Manage self-directed learning and work, making learning and task-related decisions to achieve goals and plans with a degree of autonomy.
- Work collaboratively with diverse teams as a leader or member, demonstrating a sense of responsibility towards oneself and society.

2. Intermediate Diploma or its equivalent

General learning outcomes for Intermediate Diploma programs in AI or their equivalent.

Knowledge

Graduates should be able to demonstrate knowledge of:

- A set of concepts, principles, and theories in mathematics, statistics, and computer science, with theoretical and technical depth in one and/or more areas of AI.
- A set of specialized knowledge and understanding of the processes, algorithms, techniques, and tools associated with AI and/or one of its branches.
- The ethical implications of emerging issues in AI.
- The fundamentals of research methodology, and methods and inquiry techniques.

Skills

Graduates should be able to:

Cognitive Skills:

- Apply relevant AI theories and principles, machine learning algorithms, and mathematical models and adapt them to specific and novel contexts.
- Analyze moderately complex and novel problems and issues, as well as apply relevant AI principles, machine learning algorithms, and mathematical models to find solutions.
- Employ critical thinking and creativity to devise innovative solutions for automating operations, developing intelligent decision support systems, and simulating real-world scenarios in moderately complex, novel contexts.
- Conduct research or inquiries into novel issues and/or problems.

Skills

Communication and Information Technology Skills:

- Communicate knowledge and skills in AI or its subfields through written and oral communication, and deliver presentations to diverse audiences effectively.
- Utilize and interpret moderately complex and novel numerical data and graphical representations in the field of AI.

Values, Responsibility, and Autonomy

Within moderately complex and novel contexts, graduates should be able to:

- Uphold academic values and ethical code of the AI profession, and exhibit responsible citizenship when addressing AI issues with ethical implications.
- Manage self-directed learning and work, making learning and task-related decisions to achieve goals and plans with a moderate degree of autonomy.
- Work collaboratively with diverse teams as a leader or member, demonstrating a moderate sense of responsibility towards oneself and society.

Bachelor's Degree (Level 6)

A. Bachelor's Degree Program in AI

Knowledge

Graduates should be able to demonstrate knowledge of:

- A comprehensive, in-depth, and integrated framework of concepts, principles, and theories in mathematics, statistics, and computer science.
- A profound understanding of data structures, algorithms, and AI techniques, along with the latest best practices in the field.
- A broad range of specialized knowledge and understanding based on recent advancements in AI, such as computer vision, robotics, and natural language processing.
- A grasp of research methodologies and methods, inquiry techniques, and an awareness of the ethical implications of emerging issues in AI.

Skills

Graduates should be able to:

Cognitive Skills:

- Apply relevant AI theories and principles, machine learning algorithms, and mathematical models to diverse contexts.
- Analyze complex and diverse problems and issues, as well as apply relevant AI principles, machine learning algorithms, and mathematical models to find solutions.
- Employ critical thinking and creativity to devise, develop, and implement innovative solutions for automating operations, developing intelligent decision support systems, and simulating real-world scenarios in complex and diverse contexts.

Skills

Communication and Information Technology Skills:

- Written and oral communication to convey specialized knowledge and complex ideas in the field of AI or one of its branches and present them in a clear and concise manner to diverse audiences.
- Apply mathematical operations and quantitative methods to process data and information in complex and diverse AI contexts.

Values, Responsibility, and Autonomy

Within complex and diverse contexts, graduates should be able to:

- Uphold academic values and the AI profession's code of ethics, in addition to demonstrating responsible citizenship.
- Engage in continuous self-development and make independent work or learning decisions based on compelling evidence.
- Manage practical and research tasks and projects in a professional manner.
- Collaborate effectively, build, and lead diverse teams, performing a wide range of tasks responsibly.
- Actively participate in advancing the AI field to serve and develop society.

B. AI Track Bachelor's Degree

Knowledge

Graduates should be able to demonstrate knowledge of:

- A comprehensive, in-depth, and integrated framework of concepts, principles, and theories in mathematics, statistics, and computer science.
- A profound understanding of data structures, algorithms, and AI techniques, along with the latest best practices in the field.
- A broad range of specialized knowledge and understanding based on recent advancements in AI, such as computer vision, robotics, and natural language processing.
- A grasp of research methodologies and methods, inquiry techniques, and an awareness of the ethical implications of emerging issues in AI.

Skills

Graduates should be able to:

Cognitive Skills:

- Apply relevant AI theories and principles, machine learning algorithms, and mathematical models to diverse contexts.
- Analyze complex and diverse problems and issues and apply relevant AI principles, machine learning algorithms, and mathematical models to find solutions.
- Employ critical thinking and creativity to devise, develop, and implement innovative solutions for automating operations, developing intelligent decision support systems, and simulating real-world scenarios in complex and diverse contexts.

Skills

Communication and Information Technology Skills:

- Written and oral communication to convey specialized knowledge and complex ideas in the field of AI or one of its branches and present them in a clear and concise manner to diverse audiences.
- Apply mathematical operations and quantitative methods to process data and information in complex and diverse AI contexts.

Values, Responsibility, and Autonomy

Within complex and diverse contexts, graduates should be able to:

- Uphold academic values and the AI profession's code of ethics, in addition to demonstrating responsible citizenship when addressing the ethical implications of emerging issues in AI.
- Engage in continuous self-development and make independent work or learning decisions based on compelling evidence.
- Manage practical and research tasks and projects in a professional manner.
- Collaborate effectively, build, and lead diverse teams, performing a wide range of tasks responsibly.

4. Master's Degree (Level 7)

Master's Degree in AI

Knowledge

Graduates should be able to demonstrate knowledge of:

- A specialized, in-depth framework of concepts, principles, and theories in the field of AI.
- A deep understanding of the operations, practices, tools, and techniques in the field of AI or one of its branches, including the latest best practices in the field.
- An advanced understanding of recent developments in the field of AI or one of its branches.
- An advanced understanding of research and inquiry methods in the field of AI.

Skills

Graduates should be able to:

Cognitive Skills:

- Analyze complex and advanced problems and issues, as well as apply relevant AI principles and theories, machine learning algorithms, and mathematical models to find solutions.
- Critically evaluate, review, and provide informed opinions on concepts, principles, and theories in the field of AI and/or machine learning, delivering innovative outcomes in complex and advanced AI contexts.
- Devise, develop, and implement innovative solutions for automating processes, developing intelligent decision support systems, and simulating real-world scenarios in complex and advanced contexts.
- Conduct advanced research and professional projects utilizing specialized AI research and inquiry methodologies.

Skills

Communication and Information Technology Skills:

- Written and oral communication to convey specialized knowledge and complex ideas in the field of AI or one of its branches and present them in a clear and concise manner to diverse audiences.
- Identify, select, and utilize advanced technical tools and applications, employing and adapting them to process and analyze a wide range of data and information to support pioneering research and/or projects related to the field of AI.

Values, Responsibility, and Autonomy

Within complex and diverse contexts, graduates should be able to:

- Uphold integrity and academic and professional values in the field of AI when addressing social and ethical issues related to AI.
- Take initiative to plan for continuous self-learning and professional development, and make highly independent strategic work or learning decisions.
- Manage specialized practical and research tasks and projects in a highly professional manner.
- Collaborate and participate effectively, leading research projects and teams and assuming a high degree of responsibility.
- Actively participate in advancing the AI field to enhance the quality of life in

5. PhD (Level 8)

Doctoral Degree in AI

Knowledge

Graduates should be able to demonstrate knowledge of:

- A deep, specialized, and integrated framework of highly advanced concepts, principles, and theories in the field of AI or one of its branches, in addition to some related disciplines.
- A nuanced, detailed understanding of the operations, practices, tools, and techniques in the research and applied fields of AI.
- Recent advancements, emerging issues, and challenges in the field of AI and their associated societal and ethical implications.
- Cutting-edge and novel AI advancements stemming from original research and scholarly activities in the field of AI.

Skills

Graduates should be able to:

Cognitive Skills:

- Address leading and highly advanced problems in highly complex contexts by employing modern and advanced theories in the field of AI and/or relevant machine learning algorithms and mathematical models.
- Critically evaluate, integrate, and review modern AI concepts, principles, and theories to develop creative, innovative, and pioneering solutions for designing and implementing highly complex and advanced intelligent systems that support decision-making in real-world life challenges.
- Conduct highly advanced research and professional projects to generate original knowledge that contributes to the advancement of the field of AI.

Skills

Communication and Information Technology Skills:

- Written and oral communication to disseminate and promote original knowledge and novel insights, and to engage in scholarly and professional discourse with peers, specialized groups, and the broader community.
- Processing and interpreting quantitative and/or qualitative data, and utilizing it to conduct high-complexity, cutting-edge research, projects, or innovations

Values, Responsibility, and Autonomy

Within novel and highly complex contexts, graduates should be able to:

- Conduct qualitative research that adheres to AI ethics, relevant ethical principles, and legal frameworks.
- Uphold the highest standards of academic and professional integrity in the field of AI when addressing emerging issues.
- Continuously develop professional expertise and make fully independent strategic academic and professional decisions.
- Manage specialized, pioneering, and research-based practical tasks and projects professionally and effectively.
- Collaborate and participate effectively, leading research projects and teams and assuming a full responsibility.
- Advance the field of AI to contribute to building a knowledge-based society and enhancing the quality of life.

Chapter Four :

Knowledge Units

Knowledge Units for Associate, Intermediate, and Advanced Diplomas

	Knowledge Units	الوحدات المعرفية الأساسية
1	Introduction to Computing	مقدمة في الحوسبة
2	Fundamentals of Programming	أساسيات البرمجة
3	Foundations of Statistics and Probability	أساسيات الإحصاء والاحتمالات
4	Foundation of Machine Learning	أساسيات تعلم الآلة
5	Optimization algorithms	خوارزميات التحسين
6	Introduction to AI	أساسيات الذكاء الاصطناعي
7	Deep learning	التعلم العميق
8	NLP	معالجة اللغة الطبيعية (اختياري)
9	Computer Vision	الرؤية الحاسوبية (اختياري)
10	Introduction to Ethics	مقدمة في أخلاقيات الذكاء الاصطناعي
11	Internship	فترة التدريب

Knowledge Units for Bachelor's Degree

	Knowledge Units	الوحدات المعرفية الأساسية
1	Linear Algebra	الجبر الخطي
2	Discrete Math	الرياضيات المتقطعة
3	Probability and Statistics	الإحصاء والاحتمالات
4	Calculus	التفاضل والتكامل
5	Introduction to programming	مقدمة في البرمجة
6	Object-oriented programming	البرمجة الشيئية
7	Design and Analysis of Algorithms	تصميم وتحليل الخوارزميات
8	Data Structures	هياكل البيانات
9	Introduction to Databases	مقدمة إلى قواعد البيانات
10	Introduction to AI	أساسيات الذكاء الاصطناعي
11	Introduction to Machine Learning	مقدمة في تعلم الآلة
12	Deep learning	التعلم العميق
13	Knowledge based reasoning and representation	التمثيل والاستدلال فى الذكاء الاصطناعى
14	Planning, Searching, and Scheduling	التخطيط والبحث والجدولة
15	Optimization	خوارزميات التحسين
16	Intelligent Agents	العملاء الأذكياء
17	Data analysis and Visualization	تحليل وتصوير البيانات
18	NLP	معالجة اللغة الطبيعية
19	Computer Vision	الرؤية الحاسوبية
20	Robotics and Automation	الروبوتات
21	Ethics	أخلاقيات الذكاء الاصطناعي
22	Internship	فترة التدريب

Knowledge Units for Master's Degree

	Knowledge Units	الوحدات المعرفية الأساسية
1	Complete all basic knowledge units for the undergraduate level	إكمال جميع الوحدات المعرفية الأساسية لمرحلة البكالوريوس
2	Design and Analysis of Algorithms	تصميم وتحليل الخوارزميات
3	Advanced topics in Artificial Intelligence	مواضيع متقدمة في الذكاء الاصطناعي
4	Advanced topics in Machine Learning	مواضيع متقدمة في تعلم الآلة
5	Advanced topics in one of the following: Computer vision, Robotics, NLP.	مواضيع متقدمة فى إحدى الوحدات التالية :الرؤية الحاسوبية -الروبوتات - معالجة اللغة الطبيعية
6	Project Management	إدارة المشاريع
7	Project (Research or capstone)	إتمام رسالة أو مشروع حول موضوع في الذكاء الاصطناعي

Knowledge Units for Doctoral Degree (PhD)

The framework does not specify knowledge units for the PhD qualification. Instead, the units are determined based on the program's objectives, learning outcomes, and the fields that the doctoral dissertation will cover. This is due to the rapid advancement in the field, and to provide educational institutions with the flexibility to adapt to these advancements.

Conclusion

In conclusion, SDAIA presents this framework as a contribution to the development of AI education and the global leadership that the Kingdom aspires to achieve in this field.

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   https://www.cs.cmu.edu/bs-in-artificial-intelligence/curriculum
5. THE UNIVERSITY of EDINBURGH
   http://www.drps.ed.ac.uk/22-23/dpt/utaintl.htm
6. University of Sheffield
   https://www.sheffield.ac.uk/undergraduate/courses/2023/computer-science-artificial-intelligence-bsc#modules
7. Deakin University
   https://www.deakin.edu.au/course/bachelor-artificial-intelligence
8. Indian Institute of Science Bangalore
   https://btech-ug.iisc.ac.in/MathandComputing/courses/
9. The Hong Kong Polytechnic University (PolyU)
   https://www.polyu.edu.hk/eie/-/media/department/eie/programme/42481-programme-booklet/424812022bengbsc-scheme-in-iaie-202223full-ver20220906.pdf

10. The Chinese University of Hong Kong
    https://www.cse.cuhk.edu.hk/admission/aistn/
11. King Saud University
    https://ccis.ksu.edu.sa/en/it/it-bsc-program
12. Prince Nora University
    https://ccis.ksu.edu.sa/sites/ccis.ksu.edu.sa/files/users/user344/BSIT-Plan-2022.pdf
13. Imam Abdulrahman bin Faisal University
    https://www.iau.edu.sa/en/colleges/college-of-computer-science-and-information-technology/programs/bachelor-of-science-in-artificial-intelligence-0

Appendices

Appendix 1

Table of Reference Universities for Diploma Programs

#	University	Program	URL	Units	Certificate duration	Course duration
1	Stanford	Artificial Intelligence Graduate Certificate	URL	16	3 years	10 weeks
2	University of Toronto	Artificial Intelligence Certificate	URL		3 years	12 weeks
3	MIT	Professional Certificate Program in Machine Learning & Artificial Intelligence	URL		3 years	5 days
4	UCB	Professional Certificate in Machine Learning and Artificial Intelligence	URL		6 months	

Table of Reference Universities for Bachelor's Programs

#	University	Program	URL
1	Massachusetts Institute of Technology	Bachelor of Science in Artificial Intelligence and Decision Making	URL
2	Carnegie Mellon University	Bachelor of Science in Artificial Intelligence	URL
3	Stanford	Undergraduate program in Computer Science (Artificial Intelligence Track)	URL
4	Indiana University-Purdue University at Indianapolis	Bachelor of Arts in Artificial Intelligence	URL
5	Indian Institute of Science Bangalore	BTech program in Mathematics and Computing (AI Track)	URL
6	Kansas State University	Machine Learning and Autonomous Systems bachelor's degree	URL
7	The University of Edinburgh	Artificial Intelligence (BSc Hons)	URL
8	University of Sheffield	Computer Science (Artificial Intelligence) BSc	URL
9	Deakin University	Bachelor of Artificial Intelligence	URL
10	The University of Chicago	Bachelor of Science in Computer Science (ML Specialization)	URL
11	The Hong Kong Polytechnic University (PolyU)	Bachelor of Science (Honors) Scheme in Information and Artificial Intelligence Engineering	URL
12	The Chinese University of Hong Kong (Cuhk)	B.Eng. in Artificial Intelligence – Systems & Technologies	URL
13	Imam Abdulrahman bin Faisal University	Bachelor of Science in Artificial Intelligence	URL
14	Princess Nourah Bint Abdul Rahman University	Bachelor of Science in Artificial Intelligence Sciences	URL
15	King Saud University	Bachelor of Science in Information Technology – Data Science and Artificial Intelligence Track (DSAI)	URL

Table of Reference Universities for Master's and PhD Programs

#	University	Program	URL
1	Carnegie Mellon University	Master of Science in Robotics	URL
2	Carnegie Mellon University	Master of Science in Robotic Systems Development	URL
3	Carnegie Mellon University	Master of Science in Computer Vision	URL
4	Carnegie Mellon University	Master of Science in Machine Learning	URL
5	Carnegie Mellon University	Master of Language Technologies	URL
6	Carnegie Mellon University	Master of Science in Intelligent Information Systems	URL
7	Carnegie Mellon University	Master of Science in Artificial Intelligence and Innovation	URL
8	Stanford University	Master of Science in Computer Science (Artificial Intelligence Specialization)	URL
9	University of Michigan	Robotics Masters (MS) degree program	URL
10	Illinois Institute of Technology	Master of Artificial Intelligence	URL
11	Illinois Institute of Technology	Master of Engineering in Artificial Intelligence for Computer Vision and Control	URL
12	Korea Advanced Institute of Science & Technology	Master's Program in Artificial Intelligence	URL
13	Indian Institute of Science Bangalore	Master of Technology in Artificial Intelligence	URL
14	The University of Edinburgh	MSc in Artificial Intelligence	URL

15	Imperial College London	Artificial Intelligence MSc	URL
16	Imperial College London	The MSc in Computing (Artificial Intelligence and Machine Learning)	URL
17	Imperial College London	MSc in Computing (Visual Computing and Robotics)	URL
18	King Fahd University of Petroleum and Minerals	Master of Artificial Intelligence	URL
19	King Saud University	Master of Science in Artificial Intelligence	URL

Appendix 2

Link to Benchmarks Tables
https://www.dropbox.com/scl/fi/lq3vzlxf4xeht1kdmsgh1/.docx?rlkey=askuxq1b8h0120y7tlqwq0er7&dl=0

Appendix 3

Link to Knowledge Units and Learning Outcomes Tables
https://www.dropbox.com/scl/fi/fk993pzhp17c3dmb1iep2/.xlsx?rlkey=x2n3nq6s2ap9sh09k3ew7vb5f&dl=0