MOHAMED BIN ZAYED
UNIVERSITY OF
ARTIFICIAL INTELLIGENCE

Graduate programs prospectus

The world's first specialized research-based AI university

2022 - 2023

Professor Eric Xing
President of Mohamed bin Zayed University of Artificial Intelligence

I am pleased to welcome our second incoming class to MBZUAI, and hope to introduce prospective students to this remarkable institution.

Twenty years ago I was introduced to the concept of artificial intelligence as a graduate student at the University of California at Berkeley, as I dove into the world of computer science under Professor Richard Karp and Professor Michael Jordan, the world's foremost computer science professors. Like many of the students who arrive at the MBZUAI campus, I was eager, hopeful, and a little daunted.

In the 1990s I was setting off on a new phase in my academic journey, just as many of you students will be doing. I knew it wasn't going to be easy but I also understood the powerful potential of AI to solve some important issues.

At that time, funding for research was limited, and jobs in the field were scarce. But I was in no doubt that I had found my calling – artificial intelligence. I hope most of you will experience that same sense of purpose when you are here.

AT MBZUAI you will experience a wholly new world than the one I entered in the 1990s. As the president of the world's first graduate-level, research-based AI university, I am committed to ensuring all students receive cutting edge training from some of the most respected faculty in the field. We are working to turn MBZUAI into the epicenter of AI innovation and prepare students for careers just as the discipline comes out of the lab and into real life applications.

From the stunning, state-of-the-art campus of the Mohamed Bin Zayed University of Artificial Intelligence, we aim to nurture the next generation of technologists and developers – future leaders who will usher in the next phase of AI-enabled innovation and will help advance it applications in everything from health science to technology. We will prepare you to be leaders in science, engineering, policy, and business with the necessary understanding to unlock the potential of AI through academic research and industrial applications.

Despite all the years of research and development AI is still in its infancy, promising to be a truly transformative technology – a force for positive progress in all walks of life, a driver of social and economic growth, a pillar of the Fourth Industrial Revolution.

The University offers a fertile ground for academic freedom, embracing meritocracy and mutual respect, and seeking to become an engine for economic prosperity in the region. We will work together as the United Arab Emirates advance to the forefront of a new era of innovation and productivity – an era heralding unimagined opportunities for both the developed and developing worlds.

We will break new boundaries and forge lasting partnerships with industry. Already our first cohort is reaping the benefits as they receive offers for internships and jobs. And we intend for all our graduates to be among the most employable people in the industry through the outreach programs.

We take inspiration from our university's namesake, His Highness the Crown Prince of Abu Dhabi Sheikh Mohamed bin Zayed Al Nahyan, and of the UAE's founding father, Sheikh Zayed bin Sultan Al Nahyan, both of whom taught us that education and science are the pathway to a glorious future.

As the President of MBZUAI, I am truly honored to welcome new students and applicants to take part in this journey, and to extend Abu Dhabi's invitation to the world to unleash the power of artificial intelligence with us. We look forward to you joining us for the journey.

Read more about our Leadership on www.mbzuai.ac.ae/about

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ABOUT MBZUAI

Vision

MBZUAI aspires to be a university that leads and exemplifies the study and practice of artificial intelligence in advancing human knowledge and capability; trains future leaders in the UAE and doers who become the pillars in their specialties; and nurtures the technologies that provide the intrinsic needs for human well-being.

MBZUAI will be a pinnacle of academic and scientific life, and a hub for high-tech innovation in MENA.

Mission

Our mission is to establish and continually evolve fundamental, interdisciplinary, and collaborative research & development capability in the field of AI. We will educate students to be builders, innovators, and leaders with the breadth and depth to grow technology and enterprise in the UAE and globally.

More specifically we will design and implement:

- new operational philosophy and methods;
- organizational structures and policies;
- academic environments and supports; and
- educational principles and tools.

This will enable MBZUAI to offer researchers and students an ideal home for advanced learning, knowledge creation, technology innovation and entrepreneurship that is NOT possible elsewhere.

Research focused

The Mohamed bin Zayed University of Artificial Intelligence is the first AI-focused research university in the world. MBZUAI has partnered with the Abu Dhabi-based Inception Institute of Artificial Intelligence (IIAI), a global force in excellence and leadership of AI research, for the supervision of PhD students and curriculum development

The campus

MBZUAI is fully integrated with the city of Abu Dhabi, a vibrant capital which combines heritage with a modern lifestyle. The campus, located in Masdar City - one of the world's most sustainable urban communities - offers facilities, labs and research centers providing a unique environment in which to conduct your research.

Scholarship

MBZUAI offers full scholarship that covers 100% tuition fees and other benefits such as a monthly stipend, health insurance, and accommodation.

Professional opportunities

MBZUAI's strong connections with the UAE government, the industry and the academic world, provide a platform for our students to connect with a network of strategic partners to gain tremendous experiences through possible internships in fields such as healthcare, telecommunication, technology, government, finance and much more. It's the perfect gateway to successfully drive your professional development.

International environment

MBZUAI provides you the opportunity to work with the best minds in the world using cutting-edge technology in a research-focused environment. Applicants from all countries and nationalities are welcome as the admission and acceptance to the programs will be based on high academic standing and merit. By creating an international campus environment, MBZUAI aims to promote a culture of inclusion and development.

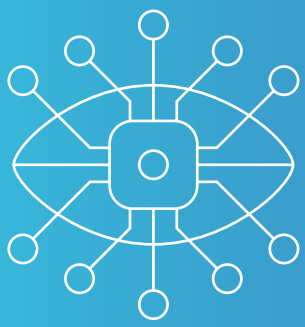
Read more on MBZUAI on www.mbzuai.ac.ae/study

This scientific field studies how computers can be used to automatically understand and interpret visual imagery. It aims to mimic the astounding capabilities of human visual cortex using machine vision algorithms.

Computer Vision studies how an image is created, the geometry of the 3D world and high-level tasks such as object recognition, object detection, and tracking, image segmentation and action recognition. Computer vision has important applications in augmented/virtual reality, autonomous cars, service robots, biometrics and forensics, remote sensing and security and surveillance.

COMPUTER VISION (CV)

MASTER OF SCIENCE IN COMPUTER VISION



Upon completion of the program requirements, the graduate will be able to:

- Exhibit comprehensive and highly specialized knowledge of computer vision in line with the underlying mathematical and computational principles.
- Perform critical literature survey and develop new ideas by integrating multidisciplinary knowledge.
- Apply advanced problem-solving skills to analyze, design and execute solutions for the existing and new problems in computer vision faced by both industry and academia.
- Become highly skilled in initiating, managing, and completing multifaceted computer vision projects, and be able to clearly communicate concepts, complex ideas and conclusions both orally and in the form of technical reports.
- Function independently and in a team to address computer vision problems under complex and unpredictable real-world settings.
- Demonstrate a fundamental understanding of computer vision discipline at an advanced level suitable to pursue a PhD degree and contribute to cutting-edge computer vision research to produce new knowledge or take responsibility to lead innovative and impactful computer vision projects in the industry.
- Manifest the right learning attitude during coursework and research that clearly shows ownership, personal and technical growth and responsibility.
- Understand legal, ethical, environmental and socio-cultural ramifications of computer vision technologies, and be able to make informed and fair decisions on complex practical issues.

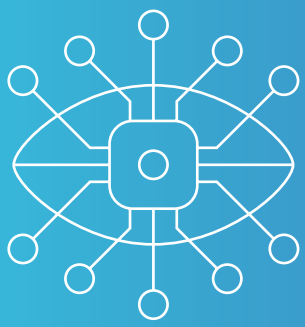
MSc programs
The minimum degree requirements for **MBZUAI** MSc programs are 35 credits, distributed as follows:

Core courses
4 courses - 15 credit hours

Elective courses
2 courses - 8 credit hours

Research thesis
1 course - 12 credit hours

DOCTOR OF PHILOSOPHY IN COMPUTER VISION



Upon completion of the program requirements, the graduate will be able to:

- Master the fundamental knowledge of computer vision and develop expertise in several specialized areas of research in computer vision.
- Grow expertise in comprehending existing literature, apply reasoning, and master the necessary skills and techniques to develop novel ideas that are recognized by the experts of the computer vision discipline.
- Apply advanced problem-solving skills to analyze, design and execute innovative solutions for the existing and/or new problems faced in both industry and academia.
- Become highly skilled in initiating, managing and completing technically challenging computer vision projects and be able to clearly communicate concepts, highly complex ideas and key findings in the form of technical reports, scientific publications and oral presentations at relevant technical venues.
- Become an expert in selecting and using programming tools, libraries, and other relevant resources to solve real-world computer vision problems.
- Develop an advanced ability to work independently with substantial authority or in team collaboration with professional integrity to complete highly challenging computer vision projects in a timely manner.
- Develop a deep understanding of the existing body of knowledge and the ability to develop new knowledge in computer vision that makes students suitable for a role in academia or industry.
- Practice research ethics and commit to professional responsibilities while conducting cutting edge advancements in computer vision discipline.
- Understand legal, ethical, environmental and sociocultural ramifications of computer vision technologies, and be able to take a lead in making informed and fair decisions on complex issues.

PhD programs
The minimum degree requirements for **MBZUAI** PhD programs are 59 credits, distributed as follows:

Core courses
4 courses - 15 credit hours

Elective courses
2 courses - 8 credit hours

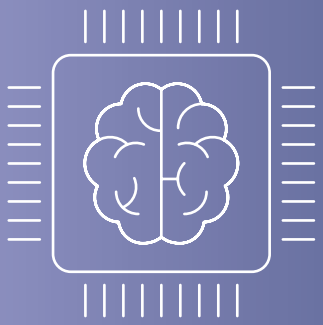
Research thesis
1 course - 36 credit hours

The scientific study of algorithms and statistical models that computer systems use to effectively perform a specific task without using explicit instructions, relying on patterns and inference instead.

Algorithms are based on mathematical models learned automatically from data, thus allowing machines to intelligently interpret and analyze input data to derive useful knowledge and arrive at important conclusions. Machine learning is heavily used for enterprise applications (e.g., business intelligence and analytics), effective web search, robotics, smart cities and understanding of the human genome.

MACHINE LEARNING (ML)

MASTER OF SCIENCE IN MACHINE LEARNING



Upon completion of the program requirements, the graduate will be able to:

- Exhibit highly specialized understanding of the modern machine learning pipeline: data, models, algorithmic principles, and empirics.
- Achieve advanced skills in data-preprocessing and using various exploration and visualization tools.
- Demonstrate critical awareness of the capabilities and limitations of the different forms of learning algorithms.
- Obtain advanced capabilities to critically analyze, evaluate, and continuously improve the performance of learning algorithms.
- Acquire advanced abilities to analyze computational and statistical properties of advanced learning algorithms and their performance.
- Gain expertise in using and deploying machine learning-relevant programming tools for a variety of complex machine learning problems.
- Develop advanced problem-solving skills through independently applying machine learning methods to multiple complex problems, and demonstrate expertise in dealing with ambiguity in a problem statement.
- Apply sophisticated skills in initiating, managing, and completing multiple project reports and critiques on variety of machine learning methods, that demonstrate expert understanding, self-evaluation, and advanced skills in communicating highly complex ideas.

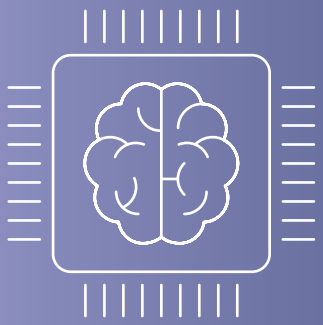
MSc programs
The minimum degree requirements for **MBZUAI** MSc programs are 35 credits, distributed as follows:

Core courses
4 courses - 15 credit hours

Elective courses
2 courses - 8 credit hours

Research thesis
1 course - 12 credit hours

DOCTOR OF PHILOSOPHY IN MACHINE LEARNING



Upon completion of the program requirements, the graduate will be able to:

- Obtain rigorous mathematical background and advanced reasoning capabilities to express comprehensive and deep understanding of the pipelines at the frontier of machine learning: data, models, algorithmic principles and empirics.
- Master a range of skills and techniques in data preprocessing, exploration, and visualization of data-statistics as well as complex algorithmic outcomes.
- Have a critical awareness of the capabilities and limitations of the different forms of learning algorithms and the ability to critically analyze, evaluate, and improve the performance of the learning algorithms.
- Grow expert problem-solving skills through independently applying the principles and methods learned in the program to various complex real-world problems.
- Develop a deep understanding of statistical properties and performance guarantees including convergence rates (in theory and practice) for different learning algorithms.
- Become an expert in using and deploying machine learning-relevant programming tools for a variety of machine learning problems.
- Grow proficiency in identifying the limitations of existing machine learning algorithms and the ability to conceptualize, design, and implement an innovative solution for a variety of highly complex problems to advance the state-of-the-art in machine learning.
- Able to initiate, manage, and complete research manuscripts that demonstrate expert self-evaluation and advanced skills in communicating highly complex ideas related to machine learning.
- Obtain highly sophisticated skills in initiating, managing, and completing multiple project reports and critiques on a variety of machine learning methods, that demonstrates expert understanding, self-evaluation, and advanced skills in communicating highly complex ideas.

PhD programs
The minimum degree requirements for **MBZUAI** PhD programs are 59 credits, distributed as follows:

Core courses
4 courses - 15 credit hours

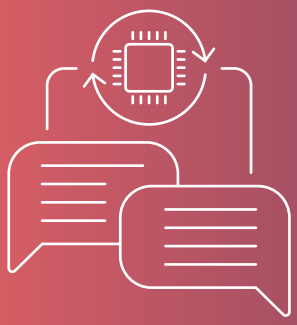
Elective courses
2 courses - 8 credit hours

Research thesis
1 course - 36 credit hours

NLP focuses on system development that allows computers to communicate with people using everyday language. Natural language generation systems convert information from the computer database into readable or audible human language and vice versa. Such systems also enable sophisticated tasks such as inter-language translation, semantic understanding, text summarization and holding a dialog. The key applications of NLP algorithms include interactive voice response applications, automated translators, digital personal assistants (e.g., Siri, Cortana, Alexa), chatbots and smart word processors.

NATURAL LANGUAGE PROCESSING (NLP)

MASTER OF SCIENCE IN NATURAL LANGUAGE PROCESSING



Upon completion of the program requirements, the graduate will be able to:

- Demonstrate a highly specialized understanding of the computational techniques for analyzing and modeling textual and speech data with applications to real-world scenarios.
- Have a deep understanding of the syntactic and semantic structures in speech and textual data (e.g. the predicate argument structure).
- Obtain advanced capabilities to implement the cutting-edge NLP algorithms, and benchmark the achieved results.
- Have the capability to formulate their own research questions, analyze the existing body of knowledge, propose and develop solutions to new problems.
- Obtain expertise in using and deploying NLP-related programming tools for a variety of NLP problems.
- Work independently as well as part of a team, in a collegial manner, on NLP related projects.
- Effectively communicate experimental results and research findings orally and in writing, and critique existing body of work.

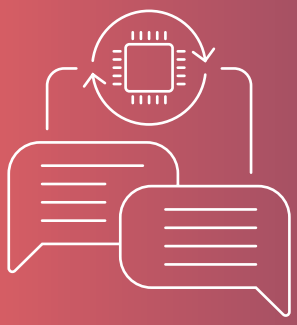
MSc programs
The minimum degree requirements for **MBZUAI** MSc programs are 35 credits, distributed as follows:

Core courses
4 courses - 15 credit hours

Elective courses
2 courses - 8 credit hours

Research thesis
1 course - 12 credit hours

DOCTOR OF PHILOSOPHY IN NATURAL LANGUAGE PROCESSING



Upon completion of the program requirements, the graduate will be able to:

- Develop a deep and comprehensive understanding of cutting-edge NLP algorithms with applications to real-life scenarios.
- Implement, evaluate and benchmark existing state-of-the-art in NLP scholarly publications and weigh in their respective pros and cons.
- Grow capabilities to identify open research problems, the gaps in the existing body of knowledge, and formulate new research questions.
- Independently develop innovative solutions, through extensive research and scholarship, to resolve unsolved research problems in high-impact real-life applications of NLP.
- Demonstrate expert knowledge and highly specialized cognitive and creative skills in NLP to deliver state-of-the-art solutions to existing open research problems.
- Pursue an NLP project either independently, or as part of a team in a collegial manner, with minimal supervision.
- Initiate, manage, and complete research manuscripts that demonstrate expert self-evaluation and advanced skills in scientifically communicating highly complex ideas.
- Develop highly sophisticated skills in initiating, managing, and completing multiple project reports and critiques, on a variety of NLP problems, that demonstrate expert understanding and advanced skills in communicating highly complex ideas.

PhD programs
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Core courses
4 courses - 15 credit hours

Elective courses
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Research thesis
1 course - 36 credit hours

ADMISSION CRITERIA

Applicants must satisfy the following minimum requirements to apply for MBZUAI programs:

FOR MSc PROGRAMS

Completed Degree

Bachelor's degree in a S.T.E.M field such as Computer Science, Electrical Engineering, Computer Engineering, Mathematics, Physics and other relevant Science and Engineering majors, from a university accredited or recognized by the UAE Ministry of Education (MoE). Students should have a minimum CGPA of 3.2 (on a 4.0 scale) or equivalent.

Applicants must provide their completed degree certificates and transcripts (in English) when submitting their application. Senior-level students can apply initially with a copy of their transcript and expected graduation letter and upon admission must submit the official completed degree certificate and transcript. A degree attestation (for degrees from the UAE) or an equivalency certificate (for degrees acquired outside the UAE) should also be furnished within their first semester at the university.

English Language Proficiency

Each applicant has to show proof of English language ability by providing valid certificate copies of either of the following:

- Standard TOEFL iBT with a minimum total score of 90
- IELTS Academic with a minimum overall score of 6.5
- EmSAT English with a minimum score of 1550

TOEFL iBT and IELTS Academic certificates are valid for two (2) years from the date of the exam while EmSAT results are valid for eighteen (18) months.

Waiver requests from eligible applicants who are citizens (by passport or nationality) of UK, USA, Australia, and New Zealand who completed their studies from K-12 until Bachelor's degree and Master's degree (if applicable) from those same countries will be processed. They need to submit notarized copies of their documents during the application stage and attested documents upon admission. Waiver decisions will be given within seven days after receiving all requirements.

Graduate Record Examination (GRE)

A general test certificate is optional and submitting one will be considered a plus during the evaluation.

Statement of Purpose

In an 800-word essay, explain why you would like to pursue a graduate degree at MBZUAI and include the following information:

- Motivation for applying to the university.
- Personal and academic background and how it makes you suitable for the program you are applying for
- Goals as a prospective student
- Preferred career path and plans after graduation.
- Any other details that will support the application.

*Stand-out achievements, e.g., awards, distinction, etc.

The admission deadlines are available at:
www.mbzuai.ac.ae/study/admissions

Entry Exam

Selected applicants will be invited to participate in an entry exam that will include questions related to the following topics:

- **Math: basic Math questions related to Calculus, Probability Theory, Linear Algebra and Optimisation.**

MSc applicants are recommended to read about these topics especially on how they are related to Machine Learning. They can find tons of materials online. For instance, they can search "linear algebra for machine learning" on YouTube and get to see many video lectures. In addition, they can find courses on sites like Coursera, Udemy, and many others. Applicants are encouraged to review as many as possible resources. Below is one of the recommended website for the Mathematics for Machine Learning: https://mml-book.github.io/

- **Machine Learning: No previous background is needed for MSc applicants.**

- **Programming**

MSc applicants will be asked basic programming questions. Most questions are in Python but the specific language is not a problem since the questions are algorithmic rather than language-specific. Basic understanding about different data structures such as Arrays, Stacks, Queues, etc is important. In addition, it is also important to read about different programming algorithms such as sorting and searching algorithms, and complexity. MSc applicants will be asked questions which require finding the output of a piece of code, finding the problem/error in a short code, and finding the code which performs a specific task.

The exam instructions are available through this link.

General admision interview with the Student Affairs team

Applicants must satisfy the following minimum requirements to apply for MBZUAI programs:

FOR PhD PROGRAMS

Completed Degree

Bachelor's degree in a S.T.E.M field such as Computer Science, Electrical Engineering, Computer Engineering, Mathematics, Physics and other relevant Science and Engineering majors, from a university accredited or recognized by the UAE Ministry of Education (MoE) which demonstrates academic distinction in a discipline appropriate for the doctoral degree. Students should have a minimum CGPA of 3.5 (on a 4.0 scale) or equivalent.

OR

Bachelor's and Master's degrees in S.T.E.M fields such as Computer Science, Electrical Engineering, Computer Engineering, Mathematics, Physics and other relevant Science and Engineering majors, from a university accredited or recognized by the UAE Ministry of Education (MoE). Students should have a minimum CGPA of 3.2 (on a 4.0 scale) or equivalent.

Applicants must provide their completed degree certificates and transcripts (in English) when submitting their application. Senior-level students can apply initially with a copy of their transcript and expected graduation letter and upon admission must submit the official completed degree certificate and transcript. A degree attestation (for degrees from the UAE) or an equivalency certificate (for degrees acquired outside the UAE) should also be furnished within their first semester at the university.

English Language Proficiency

Each applicant has to show proof of English language ability by providing valid certificate copies of either of the following:

- Standard TOEFL iBT with a minimum total score of 90
- IELTS Academic with a minimum overall score of 6.5
- EmSAT English with a minimum score of 1550

TOEFL iBT and IELTS Academic certificates are valid for two (2) years from the date of the exam while EmSAT results are valid for eighteen (18) months.

Waiver requests from eligible applicants who are citizens (by passport or nationality) of UK, USA, Australia, and New Zealand who completed their studies from K-12 until Bachelor's degree and Master's degree (if applicable) from those same countries will be processed. They need to submit notarized copies of their documents during the application stage and attested documents upon admission. Waiver decisions will be given within seven days after receiving all requirements.

Graduate Record Examination (GRE)

A valid Graduate Record Examination (GRE) General Test certificate with the following minimum scores is mandatory for applicants applying with only a bachelor's degree:

- 150 in Verbal Reasoning
- 150 in Quantitative Reasoning
- 3.0 in Analytical Writing

The admission deadlines are available at:
www.mbzuai.ac.ae/study/admissions

Statement of Purpose

In a 500 to 1,000-word essay, please explain why you would like to pursue a graduate degree at MBZUAI and include the following information:

- Motivation for applying to the university.
- Personal and academic background and how it makes you suitable for the program you are applying for
- Goals as a prospective student
- Preferred career path and plans after graduation.
- Any other details that will support the application.

*Stand-out achievements, e.g., awards, distinction, etc.

Research Statement

The Research Statement is a document summarizing the potential research project an applicant is interested in working on and clearly justify the research gap which the applicant would like to fill in over the course of his/her study. It must be presented in the context of currently existing literature and provide an overview of how the applicant aims to investigate the underlying research project as well as predict the expected outcomes. It should mention the relevance and suitability of the applicant's background and experience to the project and highlight the project's scientific and commercial significance. The Research Statement should include the following details:

- Title
- Problem definition
- Literature review
- Proposed research/methods/solution (optional)
- Study timeline (a table, figure or a small paragraph presenting your plans for the 4 years in the PhD program)
- List of references

Applicants are expected to write the research statement independently. MBZUAI faculty will NOT help write it for the purpose of the application. The MBZUAI selection team will review the submitted document and use it as one of the measures to gauge and assess applicants' skills.

Entry Exam

Selected applicants will be invited to participate in an entry exam that will include questions related to the following topics:

- **Math: basic Math questions related to Calculus, Probability Theory, Linear Algebra and Optimisation.**

PhD applicants are recommended to read about these topics especially on how they are related to Machine Learning. They can find tons of materials online. For instance, they can search "linear algebra for machine learning" on YouTube and get to see many video lectures. In addition, they can find courses on sites like Coursera, Udemy, and many others. Applicants are encouraged to review as many as possible resources. Below is one of the recommended website for the Mathematics for Machine Learning. https://mml-book.github.io/

- **Machine Learning**

PhD applicants are expected to have basic understanding of different machine learning algorithms and concepts such as linear regression, decision trees, loss functions, support vector machines, classification, regression, clustering, convolutional neural networks, etc is important. They don't have to master these concepts, but they need to have basic knowledge. There are a lot of online courses and tutorial to get PhD applicants prepared. They will find video lectures on YouTube, Coursera, Udemy, and many others. Applicants are encouraged to review as many as possible resources. Below is one of the recommended website for the Deep Learning, https://www.deeplearningbook.org/

- **Programming**

Strong programming background is important for PhD applicants. They will be asked programming questions. Most questions are in Python but the specific language is not a problem since the questions are algorithmic rather than language-specific. Therefore, it is important to read about different data structures such as Arrays, Stacks, Queues, etc. It is also important to read about different programming algorithms such as sorting and searching algorithms, and complexity. PhD applicants will be asked questions which require finding the output of a piece of code, finding the problem/error in a short code, and finding the code which performs a specific task.

The exam instructions are available through this link.

Technical admission interview with MBZUAI faculty

UNIVERSITY CALENDAR

The **MBZUAI academic year** is divided into two semesters - Fall and Spring. Classes are held Sundays through Thursdays; Fridays and Saturdays are considered as weekends.

The university calendar is available at:
www.mbzuai.ac.ae/study#univ-calendar

LIVING IN ABU DHABI

MBZUAI is based in **Abu Dhabi**, the capital of the United Arab Emirates (UAE). The UAE is a young country that crowns its traditions and cultural beliefs with a solid vision towards a prosperous and productive future for all citizens and residents.

Studying and working in the UAE means first and foremost working in the very center of the Middle East's economic hub. Abu Dhabi city is ruled by **H. H. Sheikh Khalifa bin Zayed Al Nahyan**, who is also the President of the UAE.

Abu Dhabi is a modern cosmopolitan city with towering skyscrapers, gleaming beaches, five-star entertainment, resplendent public parks, a budding art scene, and modern health and educational sectors. The city is also one of the most open and progressive communities in the Gulf region, **awarded as the safest city in the world for 5 years in a row (2017 - 2021) by Numbeo**.

For more information about Abu Dhabi, please visit https://visitabudhabi.ae/ae-en/default.aspx

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For admission inquiries:
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Career opportunities:
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