

THE NODE

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DEMOCRATIZING LLMs, ENHANCING SUSTAINABILITY

The university is helping to create large language models that support inclusion and sustainability

HEALTH CARE ACCESS AND PERSONALIZED MEDICINE

MBZUAI projects include AI-powered health tools for treatment and lower-cost drug development

STUDENTS AT THE FOREFRONT OF AI INNOVATION

Students are developing solutions that push technological boundaries and generate a positive impact on society



**MOHAMED BIN ZAYED
UNIVERSITY OF
ARTIFICIAL INTELLIGENCE**



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WELCOME

to the second edition of The Node, a magazine dedicated to highlighting how MBZUAI is delivering on the needs of the nation for AI talent development, research, and innovation.

At the time of going to print, the university is looking to its third commencement ceremony – a moment of reflection on the institution's progress and aspirations. This year's ceremony has particular significance as it will see Numan Saeed become our first-ever MBZUAI Ph.D. graduate. He will be awarded his degree in recognition for his research into how deep learning models can assist in the treatment of head and neck cancer.

The university continues to attract leading AI researchers. In this issue, you can learn more about some of the individuals helping to enhance the university's global academic prominence, as well as its R&D capabilities, connections to global science, capacity for talent development, and participation in leading international conferences (page 12).

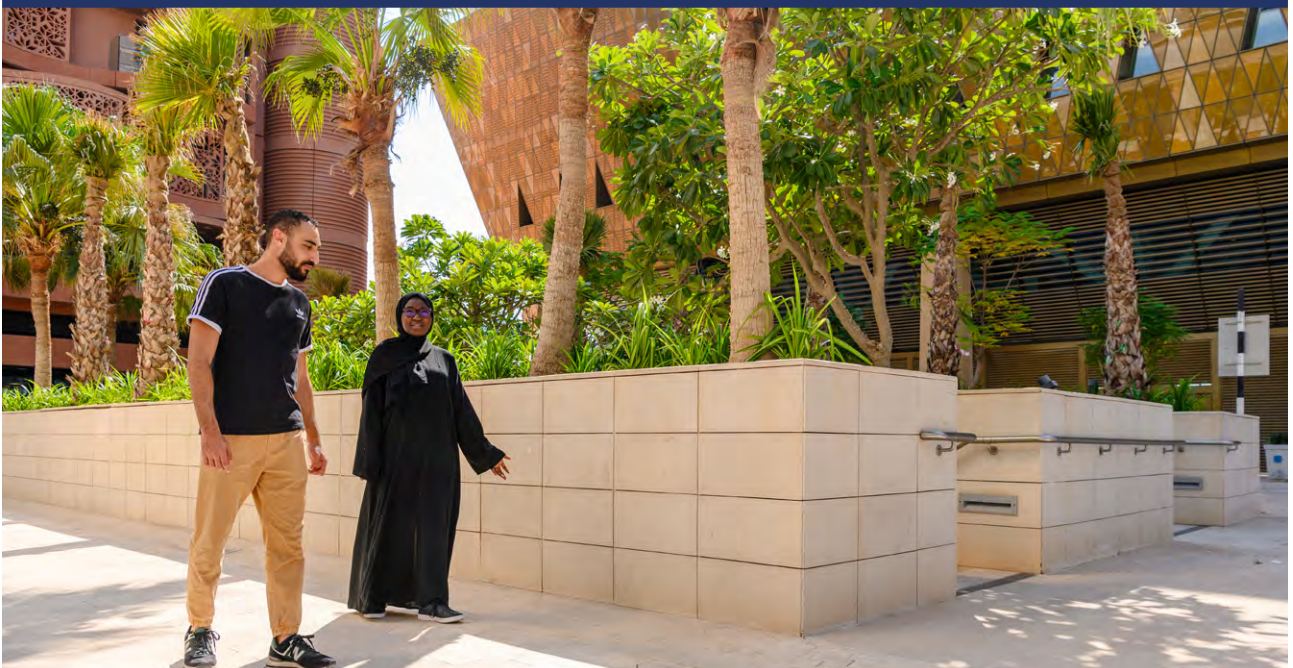
As Dubai successfully hosted the 2023 United Nations Climate Change Conference, COP28 UAE,

read how MBZUAI students and faculty are delivering large language models that support environmental sustainability, as well as linguistic and financial inclusion, and access to transformative innovation (page 8).

In keeping with our commitment to collaborate with industry leaders in the UAE and develop skillsets aligned with market needs, read about our partnership with IBM on page 14. Meanwhile, page 18 outlines how MBZUAI initiatives are promoting accessible and innovative education by bridging learning gaps with futuristic and tailor-made educational experiences.

Page 20 showcases MBZUAI health sector research highlights, including how university faculty are making personalized medicine a reality in collaboration with UAE health authorities and the UAE Genome Project.

Finally, our article on page 24 features five students who are pushing the boundaries of technology and making an impact on society, showcasing MBZUAI's culture of nurturing talent, fostering diversity, and driving ground-breaking innovation.





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HEALTH. AI FOR EDUCATION. AI

Both COP28 and Abu Dhabi Sustainability Week 2023 saw experts from MBZUAI host talks on AI's problem-solving capacity to address climate change, as well as challenges in education and health care.

MBZUAI IN NUMBERS

Top 20



globally for AI, computer vision, machine learning, and natural language processing, according to CSRankings*

4:1



student:faculty ratio

FACULTY



60+

research faculty

from universities including Oxford, Carnegie Mellon, and Stanford



138%

faculty growth since 2021



61%

of faculty from top-100 AI institutions globally

STUDENTS



276

students



70%

pursuing Master's degrees



30%

pursuing PhD



18%

Emirati students



82%

international students



39%

female



42

countries

spanning North America, Europe, Central Asia, Latin America, Middle East and North Africa, the Caribbean, East and South Asia, and Sub Saharan Africa

*Top-ranked computer science institution in the Arab world, and in the Middle East and Africa; alongside institutions such as MIT, the University of California, Berkeley, ETH Zurich, and the University of Washington

RESEARCH



200+
researchers



2 new departments
launched in 2023

Robotics
Computer science

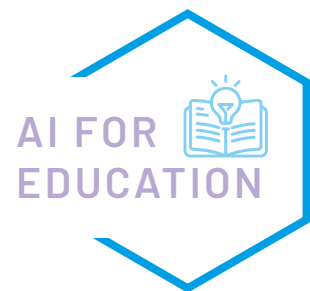
Focus areas



Supercharging drug
discovery with AI



Leading the way to net
zero with AI



Leveraging AI for the
transformation of education

LATEST STUDENT ACHIEVEMENTS

2023

Human Phenotype Project
Hackathon (MBZUAI and WIS):
1st place in Predictive Challenge

IEEE SLT International Hackathon
(held in Qatar):
**Best Potential Impact Project Award
(Autodub) and Craziest Idea Award
(Commentator Voice Synthesizer)**

Alibaba AI Hackathon (held in Dubai):
1st, 2nd and 3rd places

2022

MoIAT and EDGE 'Pioneers 4.0'
Hackathon:
1st place

DP World's Big Tech Project:
1st place

Ministry of Industry and Advanced
Technology (MoIAT) and EDGE Group
'Pioneers 4.0' Hackathon series:
1st place

Cisco Sustainability Challenge:
1st place

DEMOCRATIZING LLMs AND DRIVING PROGRESS TOWARD SUSTAINABLE MODELS

Jais is an Arabic LLM that embodies the UAE's innovative approach to AI development

In a world increasingly shaped by AI, the ability to understand and generate human language has become a vital source of progress. The university stands at the forefront of this linguistic revolution, as a leader in innovation and collaboration in the expanding realm of large language models (LLMs). MBZUAI has had a profound impact on the AI landscape through the development of models such as Jais and Vicuna that support environmental sustainability, linguistic and financial inclusion, and access to transformative innovation.

Jais: Bridging the Gap for Arabic Language Models

Jais – a collaboration between MBZUAI, Core42, which is part of Abu Dhabi's G42, and US-headquartered Cerebras Systems – is a groundbreaking Arabic LLM named after the UAE's highest peak. Jais embodies the country's spirited approach to technology and AI innovation, addressing the growing demand for Arabic language models.

Despite being one of the world's most widely spoken languages, Arabic has traditionally been underrepresented in AI, leading to disparities in the

quality of available language models. Jais empowers Arabic speakers with generative AI capabilities, helping to bridge the linguistic gap between high- and low-resource languages and providing more than 400 million Arabic speakers worldwide with access to generative AI.

One of the challenges in developing Jais lay in the scarcity of high-quality Arabic data. The solution was to train the model on a mix of Arabic and English data, taking great care in training to ensure mutual reinforcement of model capabilities between the two languages. Even in large multilingual models, the presence of Arabic tends to be diluted. **Preslav Nakov**, Department Chair and Professor of Natural Language Processing (NLP) at MBZUAI, underlined the importance of understanding the intricacies of the Arabic language and culture in developing high-caliber Arabic LLMs. Jais represents considerable progress in this regard toward enhanced linguistic inclusion.

Jais has been trained on an extensive dataset comprising 395 billion tokens, of which 116 billion are in Arabic and 279 billion are in English.



Timothy Baldwin



Preslav Nakov

جيس JAIS

The training process leveraged the immense computational power of Condor Galaxy 1, a state-of-the-art AI supercomputer developed by G42 and Cerebras Systems. Jais outperforms existing Arabic models considerably. It also rivals English models of a similar size, even with less English training data. This demonstrates the model's capacity for mutual learning between English and Arabic, signifying a transformative moment in LLM development while serving as a model for underrepresented languages in AI.

The LLM, launched in August, brings generative AI to the Arabic community, while also encouraging the broader scientific community to explore non-English LLMs. It serves as a crucial resource for researchers, developers, and enterprises in the Arabic-speaking world and beyond, and its continuous expansion ensures that it remains at the forefront of LLM technology.

Jais is open source, which represents a substantial contribution to the global AI community. Its availability on platforms such as machine-learning service Hugging Face, as well as the model's own online playground environment, demonstrates Core42's dedication to advancing AI and fostering collaboration. By making Jais open source, MBZUAI and its collaborators Core42 and Cerebras Systems aim to engage the scientific, academic, and developer communities in nurturing a vibrant Arabic language AI ecosystem.

Jais' academic partners include Carnegie Mellon University, École Polytechnique, Sorbonne Paris Nord – LIPN, and the University of Edinburgh. Prominent institutions including the UAE Ministry of Foreign Affairs, the Ministry of Industry and Advanced Technology, the Department of Health, ADNOC, Etihad Airways, First Abu Dhabi Bank, and Mubadala Investment

Company have recognized the potential of Jais and are poised to integrate the model into their operations.

Vicuna: A Leap in Environmental Sustainability

In another pivotal development, the April 2023 launch of a model of Vicuna marks one of the most impressive strides towards the environmental sustainability of LLMs. Researchers from MBZUAI, in collaboration with partners from UC Berkeley, Carnegie Mellon, Stanford, and UC San Diego, crafted Vicuna as an open-source chatbot to address concerns about the environmental impact and cost-effectiveness of LLMs – using a tiny fraction of the computational power conventionally used to instruction tune LLMs.

Vicuna is named after a relative of the llama, having been developed using

MBZUAI'S CONTRIBUTIONS REPRESENT A NEW ERA OF LINGUISTIC DIVERSITY AND ACCESSIBILITY IN AI, LEADING TO A MORE INCLUSIVE, SUSTAINABLE, AND INTERCONNECTED WORLD.

Meta AI's LLaMA 2 model. Vicuna has already left a mark on the AI ecosystem due to its high-quality performance despite a very small size-to-power ratio. Vicuna is different from more well-known models like OpenAI's ChatGPT, which require hundreds of graphics processing units (GPUs) to operate efficiently. Instead, Vicuna can run seamlessly on a single GPU accelerator.

This not only reduces energy consumption, but also makes the tool more accessible to a broader audience. "While being more energy efficient, Vicuna does not compromise on quality," said Nakov. "It boasts responses of around 90% subjective quality, running on a stunning 1% requirement measured in terms of size-to-power ratio, training cost, carbon footprint, and water consumption." With some 13 billion parameters, Vicuna challenges the notion that higher parameter counts are synonymous with superior performance, and demonstrates that quality can be achieved without posing a substantial environmental risk.

Vicuna's open-source nature has been instrumental in its rapid adoption. With over 12,000 GitHub stars – a tool for

users to bookmark crucial information – in just two weeks, it has gathered the attention of both developers and researchers. Vicuna's smaller carbon footprint and lower memory requirements compared to other models make it an attractive choice for sustainable content generation. On these two innovative models, **Timothy Baldwin**, Acting Provost, Associate Provost for Academic Affairs, and Professor of NLP at MBZUAI, said, "In an effort to democratize LLMs, MBZUAI has boldly expanded the horizons of language accessibility, facilitating a new era through the creation of open-source pathways. The development of Jais, which marks a milestone in the LLM inclusion of Arabic speakers, as well as the innovative Vicuna model, known for its affordability and thereby lighting the way for countless companies to embark on their language journey, resonate as global beacons in this direction."

Empowering Climate Action

Developed through a partnership between MBZUAI and Core42, Jais Climate is the world's first bilingual LLM dedicated to climate and sustainability. It is also the latest addition to

MBZUAI's portfolio of LLMs under its Institute of Foundation Models – a dedicated research hub for building, understanding, using, and risk-managing Foundation Models that aims to provide a transformative contribution to UAE's knowledge-driven economy.

As a means of informing national and international discussion, Jais Climate is predominantly finetuned with 1.4 million climate-related instructions to also provide detailed information about the UAE's environmental policies, as well as the upcoming 2023 United Nations Climate Change Conference, COP28 UAE in Dubai. Jais Climate was trained on ClimaInstruct, the largest instruction-based, bilingual dataset on climate and sustainability-related topics, prepared from various sources in English and Arabic languages.

Designed to support and empower a diverse audience, Jais Climate caters to government decision-makers, business leaders, students, and families, making climate data accessible to more than 400 million Arabic and 1.4 billion English speakers worldwide.

It will be on display at MBZUAI's stand at COP28 UAE from November 30 to December 12, 2023, and can be accessed at www.jaisclimate.com/ae.

When it comes to AI, language models are the engines that power human-machine interaction and understanding. MBZUAI, with contributions to models such as Jais and Vicuna, is pushing the boundaries of what AI can achieve while staying committed to environmental sustainability and inclusive AI development. These models represent a new era, when linguistic diversity and accessibility in AI are no longer just aspirations, but realities.

As Baldwin emphasized, "These achievements highlight the university's unique role in driving innovation and making these AI resources accessible to the global community. The future of AI is unfolding at MBZUAI, and it holds the promise of a more inclusive, sustainable, and interconnected world through the power of language models." With Jais, Vicuna, and other innovative LLMs, the possibilities are boundless as the ongoing AI revolution shapes the future, with MBZUAI at the forefront.



When it comes to AI, language models are the engines that power human-machine interaction and understanding



جيس JAIS CLIMATE

The world's first bilingual LLM dedicated to climate intelligence

Finetuned from 1.4 million instructions using Jais (Arabic) and Vicuna (English), Jais Climate provides detailed information about the UAE's environmental policies and is the latest addition to MBZUAI's portfolio of LLMs under its Institute of Foundation Models.



mbzuai.ac.ae/sustainability/

FACULTY ARE LEADING GLOBAL ACADEMIC CONFERENCES AS THE UNIVERSITY WELCOMES ITS FIRST US PATENT

The university's dedication to AI research reinforces its position among top-tier research institutions

MBZUAI's academic prominence in 2023 is evident through faculty achievement at leading AI conferences worldwide. These include the 37th Conference on Neural Information Processing Systems (NeurIPS 2023), the 2023 Conference on Empirical Methods in Natural Language Processing (EMNLP 2023), the 61st Annual Meeting of the Association for Computational Linguistics (ACL 2023), and this year's Institute of Electrical and Electronics Engineers/Computer Vision Foundation International Conference on Computer Vision (ICCV 2023). Meanwhile, the receipt of MBZUAI's inaugural patent from the US Patent Office marks another successful year as a leading innovator in Abu Dhabi.

NeurIPS 2023: MBZUAI's Notable Involvement

MBZUAI is set to highlight its journey in AI at NeurIPS 2023, held in New Orleans December 10-16. A total of 53 academic papers produced by MBZUAI faculty and researchers will be published at the conference, almost doubling last year's total of 27. These papers will feature 15 MBZUAI students and 26

faculty, with three faculty securing a place in spotlight presentations: **Eric Xing**, MBZUAI President and University Professor; **Kun Zhang**, Acting Chair, Professor of Machine Learning and Director of the Center for Integrative AI; and **Zhiqiang Shen**, Assistant Professor of Machine Learning. An additional three faculty are area chairs at the event: **Fahad Khan**, Deputy Department Chair and Professor of Computer Vision (CV); **Martin Takáč**, Deputy Department Chair and Associate Professor of Machine Learning; and **Salman Khan**, Associate Professor of CV. Considering that NeurIPS typically accepts only 26% of submitted papers, the scale of MBZUAI's involvement is notable.

EMNLP 2023: Expanding Academic Contributions

The university will publish an additional 44 academic papers at EMNLP 2023, held in Singapore December 6-10. This figure is a substantial increase on the 17 papers published last year. This year's papers will feature 11 university faculty. Additionally, Assistant Professor of NLP, **Ekaterina Kochmar**, is serving in the role of student volunteer chair at the



Eric Xing

conference.

ACL 2023: Faculty Contributions to NLP

MBZUAI's prominence was also clear at ACL 2023, where the university had 26 accepted papers. The event, which took place July 9-14 in Toronto, is among the top-three NLP conferences globally along with EMNLP. Faculty contributions at this prestigious conference further validate MBZUAI's position as the 18th-ranked institution worldwide, according to the latest CSRankings for publishing at leading conferences across AI, CV, machine

MBZUAI FACULTY AND STUDENTS HAVE 20 PENDING PATENTS WITH INTERNATIONAL PATENT ORGANIZATIONS, HIGHLIGHTING THE INSTITUTION'S DEDICATION TO TRANSLATING PIONEERING RESEARCH INTO TANGIBLE INNOVATIONS

learning, and NLP.

Assistant Professor of NLP, **Alham Fikri Aji**, led the charge at ACL 2023, with eight co-authored papers, collaborating with over 80 scientists from prestigious international institutions. One of these research papers, "Crosslingual Generalization through Multitask Finetuning," explores finetuning methods to enhance the performance of large language models for novel tasks in languages other than English. Aji's contributions earned recognition from Bloomberg, with six of his papers featured in its Tech at Bloomberg Select Research Papers 2023 list.

Department Chair and Professor of NLP, **Preslav Nakov**, added to MBZUAI's recognition with five published papers, including the co-authored "bgGLUE: A Bulgarian General Language Understanding Evaluation Benchmark," published in late memory of, and in conjunction with, Yale Computer Scientist, Professor Dragomir R. Radev.

ICCV 2023: Pioneering AI Research

The contributions of the MBZUAI community were also showcased at ICCV 2023, held in Paris in October, underscoring the university's status as a pioneer in AI. ICCV 2023 saw a record 8,260 paper submissions, marking a 34% increase from the preceding conference in 2021. Among the accepted papers at the event, 30 were from MBZUAI.

Professor of CV **Ivan Laptev**, renowned for his work in action recognition in video, recently joined MBZUAI and served as one of the five ICCV program chairs. Laptev has created a new CV research lab at the university, with work delving into the convergence of CV, NLP, and robotics, by addressing vision-language navigation and vision-language manipulation challenges. In this context, two papers presented

at ICCV 2023 by MBZUAI researchers garnered particular attention.

Syed Talal Wasim, a CV researcher associated with MBZUAI's Intelligent Visual Analytics Lab, introduced Video-FocalNets, an advanced CV capability for action analysis in videos. Meanwhile, the paper of **Guangyi Chen**, a post-doctoral research fellow at MBZUAI and Carnegie Mellon University, explored the translation of insights from static images to the understanding of video concepts, using fewer resources than previous models.

Innovation and Patents at MBZUAI

In September, MBZUAI achieved a milestone with its first patent from the US Patent Office. Titled "System and Method for Handwriting Generation," the patent was a collaborative effort among several key members of MBZUAI's CV community – namely, **Rao Anwer**, Assistant Professor of CV; **Ankan Bhunia**, a former CV Researcher at MBZUAI; **Hisham Cholakkal**, Assistant Professor of CV; Fahad Khan; and Salman Khan. The patent is one of 20 registered by MBZUAI faculty and students with international patent organizations, highlighting the commitment to translating pioneering research into tangible innovations.

MBZUAI's presence at international conferences emphasizes its leadership in AI research. With 53 papers accepted at NeurIPS 2023, 44 at EMNLP 2023, 26 at ACL 2023, and 30 at ICCV 2023 – combined with the university's 20th international pending patent, and first from the US Patent Office – MBZUAI faculty and researchers continue to excel on the international stage. Additionally, as showcased with the more than 670 papers published between January and October of this year, the university's dedication to AI research has reinforced its position as a top-tier global research institution and a pivotal player in innovative solutions.



Alham Fikri Aji



Ivan Laptev



Kun Zhang



Martin Takáč

In line with the university's role as a pioneer in the future of AI, MBZUAI forged an innovative partnership with US-headquartered IBM. This collaboration, which realizes the university's commitment to collaborate with industry leaders and develop skill sets aligned with market needs, goes beyond the scope of a memorandum of understanding: it is the convergence of MBZUAI's innovation and IBM's technological expertise. The two will work together to bridge linguistic gaps and advance digital inclusion through the power of AI, and address the social impacts of climate change.

The partnership is helping to accentuate MBZUAI's prominent position in the field of AI, becoming one of the region's first research universities to host a center of excellence for AI research and development. At the core of the partnership is the goal to nurture, validate, and incubate technologies that have the ability to address multifaceted challenges across the civic, social, and business domains. The collaboration's scope extends beyond theory and aims

to translate advancements in the field of AI into real-life applications.

IBM's contribution is not confined to knowledge sharing; it encompasses targeted training and technological empowerment. Through the IBM Academic Initiative, MBZUAI students and faculty can access an array of resources, spanning IBM's suite of tools, software, courses, and cloud accounts that are tailor-made for teaching, learning, and non-commercial research. Additionally, the IBM Skills Academy promises to enrich MBZUAI's educational landscape by offering curated AI curricula, informative lectures, practical labs, industry-specific use cases, immersive design-thinking sessions, and certification in AI proficiency. This comprehensive partnership opens the door to an exciting future for AI exploration and its application in the region and beyond, driven by the synergy of two global leaders in their respective domains.

The collaboration is currently focused on two major projects that reflect

a commitment to empowering the region's population. The first, led by the Computer Vision (CV) Department, pertains to climate monitoring. It leverages CV to analyze temperature trends in specific areas, paving the way for the mitigation of related challenges for communities. The second project, set to run from the summer of 2023 to 2025, addresses linguistic gaps. Under the remit of MBZUAI's Natural Language Processing (NLP) Department, the initiative seeks to help users of multiple varieties of Arabic interact with AI systems designed for government services, among other purposes.

Uniting Written Arabic Dialects

The NLP project comprises three pillars that underscore the innovative nature of the collaboration between MBZUAI and IBM. The first pillar includes the creation of a large language model (LLM) to serve the region's diverse Arabic-speaking population. The Arabic dialect LLM represents a notable step toward enabling seamless communication and interaction by

PARTNERSHIP IN FOCUS:

WIDENING ACCESS WITH IBM

MBZUAI-IBM partnership aims to leverage AI in bridging linguistic gaps through the creation of an LLM, a question-answer system, and a writing platform tailored to Arabic dialects

THE COLLABORATIVE NATURE OF THE PARTNERSHIP TO HELP BRIDGE THE LINGUISTIC DIVIDE AND CREATE A MORE INCLUSIVE LANDSCAPE, WHILE ALSO WIDENING ACCESS IN THE REGION'S DIGITAL ECOSYSTEM

focusing on the need for language models that cater to varieties of Arabic, rather than being exclusively centered on Modern Standard Arabic (MSA).

AI-Powered Question-Answer System

Complementing this, the second pillar entails the development of an advanced question-answer system tailored to Arabic dialects. Users will have the flexibility to pose questions in dialectal Arabic, MSA, or English – or, indeed, a code-switched variety – and will receive a response in either MSA or English. This system empowers individuals who may not yet possess a strong command of MSA, ensuring their active participation in the NLP domain and safeguarding against their potential marginalization. “Our joint

project with MBZUAI will enable us to create linguistic resources and LLMs that allow users – in their native dialects – to find relevant Arabic and/or English content in various NLP applications, including question-answer systems,” said Salim Roukos, IBM Fellow and Senior Manager at IBM.

Enhancing Arabic Writing with AI

The project’s third pillar offers writing assistance. The AI-powered Arabic Writing Assistant, known as AWA, takes center stage, with the ability to detect and rectify misspellings, grammatical errors, and dialectal words that may be interspersed with MSA. This tool provides guidance for those on their journey to mastering MSA, helping them not only to refine their writing skills,

but also to foster a more proficient and self-assured user base. Together, the three pillars form a dynamic approach to bridging linguistic and digital divides. “Our collaboration with IBM aims to advance NLP technology with a focus on Arabic dialects, thus making AI more accessible for Arabic speakers,” explained **Preslav Nakov**, Department Chair and Professor of NLP at MBZUAI.

The project’s dialects of focus include Levantine, Egyptian, Gulf, and Iraqi. These represent the spoken language of a considerable portion of the region’s population and are often overlooked in the development of NLP tools. The collaboration also aims to support inclusivity, adding Hindi and Urdu to the languages recognized by the system. “By addressing the needs of immigrant communities in the region, the MBZUAI-IBM partnership ensures that a broader spectrum of languages and speakers benefit from AI and digital tools,” **Teresa Lynn**, Head of NLP Research Engagement at MBZUAI, said.

This joint endeavor brings together researchers from IBM and MBZUAI, who work closely on data collection, model development, and system testing. The tools developed in this project hold significant potential for application areas in the region, such as government e-services that aim to serve a wide and linguistically diverse population. This aligns well with the UAE’s National Strategy for AI 2023, which includes a strategic objective to adopt AI across government services to improve lives.

The IBM-MBZUAI collaboration illustrates the university’s dedication to harnessing technology to ensure equitable access to AI-powered services and information. The collaborative nature of this partnership promises to help bridge the linguistic divide and create a more inclusive NLP landscape, while also widening the region’s digital access and addressing the social impacts of climate change.







In July, MBZUAI welcomed 34 of the world's most promising science, technology, engineering, and math undergraduates as part of the university's inaugural Undergraduate Research Internship Program (UGRIP). The four-week UGRIP program included an alumni panel (as pictured here), an industry panel, student research projects, and mentorship opportunities.

MBZUAI's projects are reshaping the landscape of education and language learning through a variety of applications. The Arabic Writing Assistant (AWA) leverages AI and natural language processing (NLP) to enhance Modern Standard Arabic (MSA) writing skills, offering instant feedback and bridging the gap between MSA and Arabic dialects. The Arabic Reading Assistant (ARA), meanwhile, complements AWA by classifying texts into readability categories to nurture holistic language development.

Elsewhere, MBZUAI's Metaverse Lab is exploring technologies for telepresence applications driven by virtual reality (VR) and augmented reality (AR), with the potential to transform education and communication while enabling immersive learning experiences and innovative educational approaches.

AWA: Nurturing Written Arabic Development

AWA aspires to fill a critical void in the realm of Arabic language education.

Ted Briscoe, Deputy Department

Chair and Professor of NLP, previously worked on a similar system for learners of English at Cambridge University. The Cambridge system, known as Write & Improve, allows users to upload written English compositions and receive instant feedback and tailored suggestions for improvement. At MBZUAI, Briscoe is building on the insights gained during this project to augment the experience for Arabic learners as part of the AWA initiative.

As an online platform, AWA is designed to help Arabic speakers enhance their MSA writing skills. While still in the development phase, the platform holds the potential to transform language learning in the coming years. Arabic has more than 30 varieties, each distinct from MSA, making Arabic writing akin to mastering a new language given the variation between dialects and the standardized written form.

In a world where conventional writing feedback methods may take weeks, MBZUAI's AWA is set to revolutionize the experience for Arabic language students. The platform is designed to

identify and correct common errors, with a particular focus on Arabic's morphologically complex nature. It also encourages an iterative process, whereby learners can resubmit their work and accelerate their learning.

This approach has been shown to substantially enhance language proficiency, as learners receive immediate feedback. Given that Arabic presents a unique set of linguistic challenges, such real-time insights are key to bridging the conceptual gap between dialectal forms and MSA.

"The primary goal of AWA is to support learners in mastering MSA," said Briscoe. "However, the tool's utility extends to non-native Arabic speakers looking to learn the language. With the potential to make Arabic more accessible, MBZUAI aims to preserve and promote the Arabic language in an age where English is increasingly becoming the lingua franca." AWA does not yet have a user interface or a cloud-based delivery system. However, MBZUAI expects to unveil the first version by spring 2024.

EDUCATION IN FOCUS:

REVOLUTIONIZING THE LEARNING EXPERIENCE

New research is exploring the transformative potential of AI in education and communication



Ted Briscoe

ARA: Enhancing Arabic-Language Reading Proficiency

As AWA's reading comprehension counterpart, ARA recognizes the natural progression from passive knowledge through reading to productive knowledge via writing. Accessed online, ARA provides materials with an increasingly broad and specific vocabulary, tailored to a user's language proficiency across six levels. **Ekaterina Kochmar**, Assistant Professor of NLP, who works on ARA alongside Briscoe, explained, "This progression seeks to ensure that learners are exposed to content they can comprehend while nonetheless encountering new vocabulary and grammatical structures, providing a crucial bridge for learners of MSA to improve their reading capabilities." Reading comprehension is assessed through the reader's written output, highlighting the correlation between ARA and AWA. The ARA platform is tentatively scheduled to launch in the summer of 2024, following AWA.



Ekaterina Kochmar

Exploring the Potential of VR and AR in Education

University research is exploring the transformative potential of VR and AR in education and collaboration. **Hao Li**, Associate Professor of Computer Vision (CV) and Director of the Metaverse Lab, works at the intersection of CV, graphics, and machine learning. Li aims to enable new AI and immersive technologies that can help to realize the metaverse and unlock digital experiences that are not possible in the physical world. This includes VR- and AR-driven telepresence applications, revolutionizing remote 3D collaboration and reshaping the education landscape.

The lab's focus on creating photorealistic digital humans could reimagine student-teacher interactions. This would enable innovative educational approaches, such as bringing historical figures back to life for interactive classroom experiences. The lab also explores developments in neural rendering and



Hao Li

diffusion models. Respectively, these offer the potential to digitize objects and scenes in 3D without complex graphics processing, and could generate cleaner and more realistic images from text, thereby aiding in the creation of educational content for the metaverse. Li emphasizes the lab's goal to impact various fields, including education, by fostering an ecosystem where students collaborate with top researchers and explore entrepreneurial ventures.

MBZUAI's initiatives are reshaping the educational landscape. AWA employs NLP to enhance MSA writing skills, while ARA fosters reading comprehension – thereby creating a cohesive, AI-enabled, language-learning journey. Meanwhile, MBZUAI's Metaverse Lab explores immersive technology for VR- and AR-driven education. Together, these projects highlight MBZUAI's commitment to accessible and innovative education, bridging learning gaps with futuristic and tailor-made education experiences.

MBZUAI'S METAVERSE LAB EXPLORES IMMERSIVE TECHNOLOGY FOR VR- AND AR-DRIVEN EDUCATION, HIGHLIGHTING THE UNIVERSITY'S COMMITMENT TO BRIDGING LEARNING GAPS WITH TAILOR-MADE EXPERIENCES



HEALTH IN FOCUS:

WIDENING ACCESS TO HEALTH CARE AND ADVANCING PERSONALIZED MEDICINE

MBZUAI projects drive transformation across the health care spectrum, fueled by advancements in AI

MBZUAI's commitment to groundbreaking research in the health care sector is driving transformation across multiple fronts. University-led projects in the sector include AI-driven simulations that could profoundly reshape drug development and lower related costs; the Human Phenotype Project (HPP), pushing the boundaries of personalized medicine through comprehensive health data collection and AI-enabled treatment; and an AI-powered revolution in health care access, malaria eradication, and maternal and fetal health care.

AI-Driven Simulation for Drug Development

Le Song, Professor of Machine Learning, is working on an AI-driven simulation to revolutionize drug development. The conventional

process costs nearly \$1 billion and takes almost a decade to bring new medicines to market. Song's aim is to significantly reduce both the cost and time involved in this process by creating a comprehensive model of the human body, incorporating data from the societal level down to the molecular level. This approach eliminates the need for traditional biological research in wet labs, opening up a new path for drug discovery. Song's project holds the potential to reshape the landscape of drug development in the years ahead.

Personalized Medicine and the HPP

Eran Segal, Adjunct Professor of Machine Learning, is working to realize personalized medicine, whereby medical care is matched to an individual's genetic and biological constitution by leveraging genomics

and data. The cornerstone of his initiative, the HPP, involves the meticulous measurement and analysis of individuals' diverse health parameters. This project harnesses the power of comprehensive data to make personalized medicine a reality.

Participants provide electronic health records and fill out in-depth questionnaires about their medical history, lifestyle, and psychological well-being. An array of assessments follow, including body measurements, blood tests, cardiovascular health evaluations, voice recordings, and diverse imaging techniques such as full-body scans, bone density examinations, and retina tests.

The HPP also delves into genetics, the microbiome, metabolomics, proteomics, RNA sequencing, and



MBZUAI is pushing the boundaries of personalized medicine



AI has the ability to analyze extensive datasets from millions of patients

immune function analysis. The multi-omics approach unveils a holistic understanding of an individual’s health. “This holistic profiling has yielded promising results, such as AI-driven dietary interventions to balance blood sugar levels,” Segal said. “The potential to reverse conditions like prediabetes opens the door to a future in which health care is truly individualized.”

The wealth of data and innovative analysis that will emanate from the project is paving the way for the next frontier in health care – making personalized medicine a reality, while contributing to drug development and cost reduction.

Eric Xing, MBZUAI President and University Professor, highlights the profound impact of AI on the health care sector, particularly in its ability to reshape the landscape of personalized medicine. He emphasizes that health care, with its extensive data generation, represents an ideal arena for AI’s transformative potential. Xing notes AI’s ability to equip health care professionals with deeper insights derived from data, ultimately leading to improved health care outcomes through a deeper understanding and analysis of patients, alongside informed clinical decision-making. Notably, AI has the capability to analyze extensive datasets from millions of

patients simultaneously, enabling the personalization of medical treatments.

Personalized medicine remains important to ongoing work at MBZUAI, aligned with the university’s commitment to interdisciplinary development capabilities and real-world applications of AI, benefiting society in the UAE and beyond. Xing’s appointment to the UAE Genomics Council in 2021 underscores the growing significance of the convergence of AI with genomics.

Revolutionizing Health Care Access

Mohammad Yaqub, Associate Professor of Computer Vision, is spearheading projects supported by Reaching the Last Mile, a portfolio of global health initiatives and programs funded by the philanthropy of His Highness Sheikh Mohamed bin Zayed Al Nahyan, President of the UAE, that will bring world-class health care to underserved populations around the world. Through the use of AI, these projects aim to revolutionize health care provision and accessibility.

Yaqub’s primary focus is on eradicating malaria in Indonesia and India. He is harnessing the power of AI to provide swift and accurate malaria diagnoses, eliminating the need for potentially arduous journeys to distant medical

facilities. This will not only bolster health care accessibility, but also contribute to a lower carbon footprint, as fewer people will be required to travel long distances for treatment.

The mobile app Yaqub is developing will be able to instantly analyze blood samples with only a microscope. This will facilitate precise malaria diagnoses, including type and severity. Together with **Abdulmotaleb El Saddik**, Professor of Computer Vision, and **Hosni Ghedira**, Director of Research Engagement, the broader project also encompasses advanced weather forecasting and sensory data fusion, helping to boost the precision of malaria hotspot predictions. The project started in January 2023 and is slated for completion by 2026.

“These technologies have the potential to reshape health care access, reduce travel-related challenges, and contribute positively to environmental sustainability,” Yaqub explained.

Yaqub is also working to improve fetal and maternal health care in underserved African communities. Using point-of-care ultrasound devices, he aims to make health care technology more accessible and affordable. He hopes to extend such capabilities to detect other health issues in the future, such as stroke and coronary disease.

PERSONALIZED MEDICINE REMAINS IMPORTANT TO ONGOING WORK AT MBZUAI, ALIGNED WITH THE UNIVERSITY’S COMMITMENT TO EVOLVING INTERDISCIPLINARY CAPABILITIES AND REAL-WORLD APPLICATIONS OF AI



جامعة محمد بن زايد
الذكاء الاصطناعي
MOHAMED BIN ZAYED UNIVERSITY
OF ARTIFICIAL INTELLIGENCE

How did we get here

MBZUAI

AI
ARMCHAIR



Marco Tempest, Director's Fellow at the MIT Media Lab and Creative Consultant at the NASA Jet Propulsion Laboratory (right), and Dr. Hao Li, Associate Professor of Computer Vision and Director of MBZUAI Metaverse Lab (centre), engage young AI enthusiasts at the launch of MBZUAI's AI Armchair event series.

MBZUAI STUDENTS ARE AT THE FOREFRONT OF GLOBAL AI INNOVATION

Five MBZUAI students share their journeys of pushing the boundaries of technology and making an impact on society

In the world of AI, MBZUAI students lead with innovation and a commitment to shaping a better future.

Award-Winning AI Research

Ahmed Elhagry, a current Ph.D. student at the university, gained international acclaim for his AI contributions: in June 2023, Elhagry received the Best Ph.D. Forum Paper Award at the Institute of Electrical and Electronics Engineers International Conference on Metaverse Computing, Networking, and Applications in Kyoto, Japan.



Ahmed Elhagry

Elhagry's paper, "Text-to-Metaverse: Towards a Digital Twin-Enabled Multimodal Conditional Generative Metaverse," co-authored with Professor **Abdulmoteleb El Saddik**, introduces a novel approach to harnessing multimodal AI and digital twin technology to create immersive

virtual environments. Its uses span education, architecture, and health care, promising a revolution in virtual experience development.

Elhagry credits his success to MBZUAI's research environment, highlighting Professor El Saddik and the university's critical computational resources. With two more research papers accepted at international robotics and automation conferences, he aspires to pursue a research and development career after graduating from MBZUAI.

Inspiring AI-Driven Transportation Research

MBZUAI celebrated International Women in Engineering Day by featuring two talented students pursuing a Master of Science in machine learning. One of them is experienced transportation engineer, **Fatima AlKhoori**, and the other is Rzan Alhaddad, who is a mechanical engineer. AlKhoori aims to blend her engineering background with AI solutions to drive real-world change.

AlKhoori's path was inspired by the UAE's commitment to empowering women in science, technology, engineering, and math. Her career has included roles in the Abu Dhabi Quality and Conformity Council and Khalifa University of Science and Technology, where she contributed to transportation-focused research. Her current research project centers on traffic sign detection in autonomous



Fatima AlKhoori

vehicles, with the aim of enhancing safe and effective navigation. Her research aligns with international and Emirati sustainability goals, setting the stage for a positive impact in the years ahead.

From Computer Vision (CV) to Environmental Impact

Yahia Dalbah graduated with a master's in CV from MBZUAI in June 2023. Dalbah's thesis focused on using raw radar signals for object detection and semantic segmentation in CV. Radar-based sensing holds promise for enhancing safety measures in autonomous vehicles, especially during adverse weather conditions, among other applications. Dalbah has since pivoted to an environmental science startup, motivated by AI's potential to tackle global challenges through unconventional solutions. This was kick-started by an internship

MBZUAI'S STUDENTS SHOWCASE AI'S VAST POSSIBILITIES, SPANNING IMPROVEMENTS TO SAFE TRANSPORTATION, TO COMBATING PROPAGANDA, AND CREATING INCLUSIVE LANGUAGE MODELS

at FortyGuard. The Abu Dhabi-based clean tech firm aims to cool cities and help them remain liveable in the coming years as temperatures rise, providing geospatial analysis and AI-driven temperature insights. Dalbah's contributions earned him a full-time role as a research and development engineer at the firm, where he spearheads the development of proprietary machine learning and CV algorithms, expanding the startup's capacity to provide temperature insight to both public and private institutions.

Dalbah, who credits MBZUAI for equipping him with fundamental



Yahia Dalbah

software skills, embodies the university's dedication to fostering innovative minds that drive real-world impact. His journey exemplifies how commitment and education can lead to an achievable, sustainable future.

Battle Against Propaganda in Social Media

Muhammad Umar graduated with a master's degree from MBZUAI in June 2023, in the field of natural language processing (NLP). Umar's research focused on combating propaganda in social media, a key issue in today's digital landscape. He explores propaganda detection, particularly in environments that combine high- and low-resource languages, including

Urdu, his native language. In a world susceptible to propaganda, Umar recognizes the role language plays in shaping public opinion and the challenges for detecting propaganda



Muhammad Umar

posed by code-switching between different varieties, common in bilingual communities. Umar underlines the benefits of deep-learning models, which can be trained on large volumes of data and then tailored to specific tasks for analyzing code-switched text. He had a paper on propaganda-detecting techniques in code-switched text accepted at the prestigious Conference on Empirical Methods in NLP in Singapore in December 2023.

As a data engineer at G42 Healthcare, Umar highlights the pivotal role of data science and engineering in deciphering the vast amount of data generated daily in our technology-driven world. Umar appreciates MBZUAI's supportive environment, identifying the faculty's expertise and guidance as fundamental to his growth as a researcher.

Journey from CV to NLP

Gokul Karthik Kumar is another MBZUAI class of 2023 master's graduate who blended his major in CV with a passion for NLP. His time at MBZUAI under the guidance of esteemed AI professors refined his research skills and problem-solving capabilities. He has since joined

G42's Core42, where he contributes to the development of large language models that are tailored to UAE-focused applications – aligned with the country's vision of leveraging AI for social good.

Kumar's journey has included hackathon wins, participation in major conferences, and real-world impact through innovative projects such as



Gokul Karthik Kumar

Autodub, an AI-dubbing platform that seeks to enhance the inclusivity and accessibility of online education.

Reflecting on AI advancements, Kumar highlights the transformative impact of models like ChatGPT, while also emphasizing the need to address security and privacy concerns, and develop energy-efficient AI models. Kumar is another example of MBZUAI students driving impactful change.

These stories show the vast potential that AI offers. From promoting safe and sustainable transportation, to simplifying the complexities of propaganda detection, to creating inclusive language models, these students embody the transformative power of combined education and research. As they pursue diverse career paths, the contributions of all MBZUAI students to innovation and social impact help promote progress toward the university's forward-looking vision.



The university's second commencement (pictured) took place in June 2023, with 52 graduating students from 25 countries. This included the first cohort of natural language processing graduates, as well as graduates earning master's degrees in computer vision and machine learning.





MOHAMED BIN ZAYED
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