

FORTNIGHTLY ENGINEERING REVIEW

The voice of engineers

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Engr. Najeeb resolves to contest for second term, expects allies' support

Contesting for the last time; Oldies should leave space for younger lot, PEC Chairman PEC advices former chairmen bracing for polls

By Manzoor Shaikh
 Chairman Pakistan Engineering Council (PEC) Engr. Muhammad Najeeb Haroon is determined to contest PEC Elections 2024 for the second



term and expects that his key allies—National Engineers Association (NEA), led by Engr. Abdul Qadir Shah and

Contd on page 2



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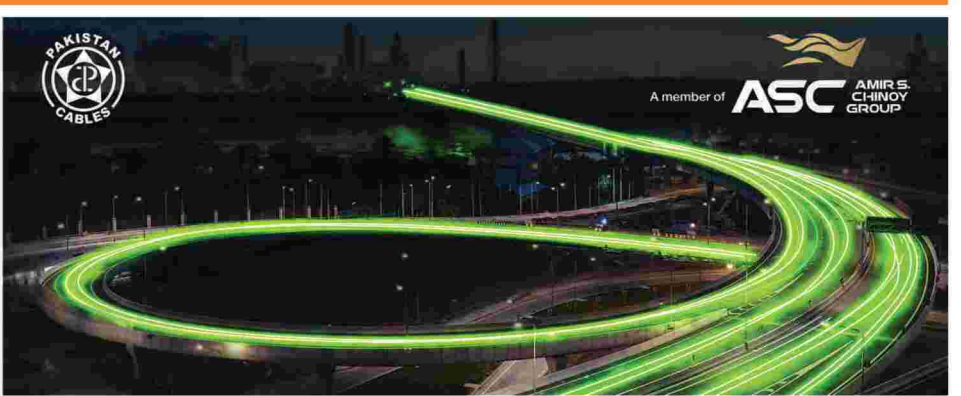
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Engr. Najeeb resolves to contest for second term, expects allies' support

Contd from page 1

Engr. Mukhtar Sheikh will support him.

'Contesting for the second tenure is my right {by the Act} and also necessary for the continuity of the programs, of them a number are very innovative ones like the On Job Training (OJT) Program and have benefitted engineers in Pakistan', Engr. Haroon told Engineering Review.

council's last GB meeting of the year 2023 with a major decision to declare the Year 2024 as the Year of Information Technology, aimed to transform the council into a technology-driven headquarters of engineers in Pakistan where colonial-style files tied with red ribbons have outplacced the offices at Islamabad advised all 'oldies' aspirants of top office who have already held the office of the chairman should step down for the younger generations.

Engr. Najeeb says Pakistan's young engi-

neers are not impotent that the older lot is clung to power and never allowed their younger generations to take the reins.

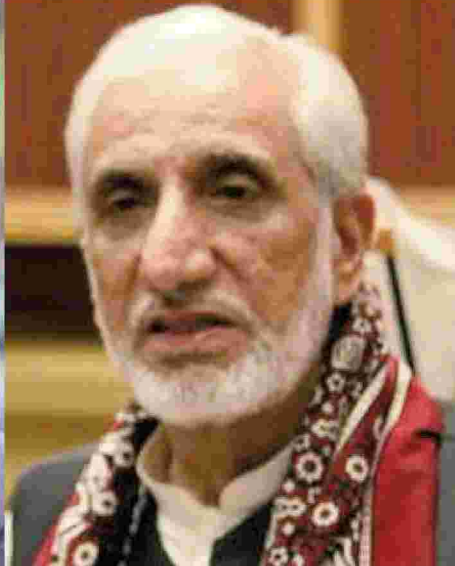
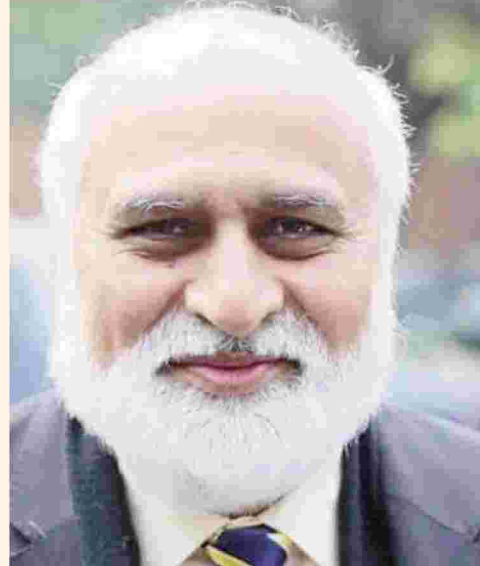
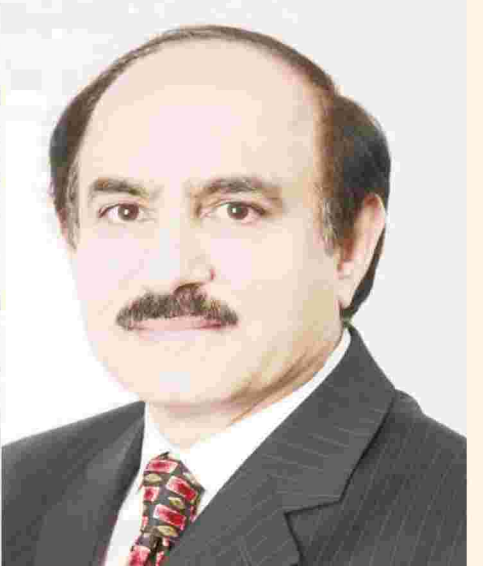
Without taking their names, he advised previous chairmen of the PEC, for floating younger leaders from their camps for the next PEC Elections.

Engr. Haroon justified his candidature for the next term on the basis of what he termed as his performance which included his efforts to transform the council into a well-connected organization at the national as well as the inter-

national levels.

He said he brought professionals to the council in various departments especially in Finance and IT. Now, they will celebrate the year 2024 as the year of IT and shall computerize all departments from top to bottom so that transparency is ensured in all processes of registrations and services to engineers and create swift connectivity with consultants both at the national as well as international levels.

Engr. Haroon claimed the PEC is now con-



I have already announced in clear terms that I would contest the PEC elections and also communicated this to my allies, friends, and my team, now it's their decision if they continue to support me, says Engr. Haroon. However, he said he expected his allies to stand along with him like they did in the last elections.

"The PEC Elections 2024 would be my last election which I shall contest in the PEC he declared saying he would never cling to it and leave space for younger generations.

Chairman PEC who presided over the

connected with international engineering organizations and has earned appreciation at various forums including the one held in Dubai recently.

A Washington Accord Review team has recently visited various universities in Pakistan and we are sure to be able to have a 6-year extension in the program, he says.

Engr. Haroon said he launched the On Job Training (OJT) Program under which over 4000 young engineers have been trained and many have gotten jobs in those organizations.

across Pakistan. Never has happened and no one has ever taken such decisions, he says. This is an outcome of a grand moot of 102 engineering universities of Pakistan that was organized in Faisalabad by the council . Capstone 2024 will be held in Islamabad and all the provincial capitals showcasing final year engineering projects which in the past mostly become part of decorative objects in universities' shelves, Engr. Najeeb says. ■

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- Richard Branson

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AIIB approves US\$250 m loan after WB's US\$350m to help Pakistan

The Asian Infrastructure Investment Bank's (AIIB) Board of Directors have approved a loan of \$250 million to help

to Pakistan's Covid-19 response to \$750 million. The statement mentioned that the health crisis is expected to have far-ranging and long-term repercussions on growth, which may undermine the hard-fought progress the

past two decades,' said AIIB Vice President, Investment Operations, Konstantin Limitovskiy. "Our immediate support is critical and will contribute to the government's efforts to mitigate pandemic-related shocks, so that

Pakistan to support key macroeconomic reforms in energy, taxation and business environment. As per the announcement of the bank, the financing was aimed to strengthen fiscal management and promote competi-

and business climate reforms geared to raising additional revenues, improve the targeting of expenditures and stimulate competition and investment." World Bank's team leader for the operation

the upcoming general elections. "Failing to use this opportunity would risk plunging the country back into stop-and-go economic cycle," he said. Importantly, the combined \$600m program would help Pakistan shore



Pakistan strengthen its response to the social and economic fallout from the Covid-19 pandemic, said the financial institution in a press release at the end of year 2023. The AIIB said that the loan is co-financed by the World Bank, adding that this development policy financing will help bolster the government's Resilient Institutions for Sustainable Economy Program.

The RISE Program is a part of a set of measures Pakistan has undertaken towards recovery from the impact of the pandemic. The program aims to stimulate investment in human capital, expand social safety nets, improve the emergency health infrastructure and foster economic growth.



stated that the latest loan brings AIIB total support

country has made in restoring macroeconomic stability. The AIIB said that pandemic has taken a toll on



employment in the formal and informal sectors, with the poor, women and other vulnerable groups disproportionately affected. "The pandemic has rapidly evolved in Pakistan and

now threatens to undo many of the hard-won gains made in reducing poverty over the

the country may continue on its path to sustainable development," he said. The AIIB said it does not have a regular instru-

ment for policy-based financing, the Bank is extending such financing on an exceptional basis under its Covid-19 Crisis Recovery Facility to support its members through projects co-financed with the World Bank or the Asian Development Bank. It merits mentioning that The World Bank had announced in December 2023 that its board of directors had approved the long-awaited \$350 million

loan '2nd Resilient Institutions for Sustainable Economy (RISE-II) Operation' to

tiveness for sustained and inclusive economic growth. The operation contributes to better fiscal management by improving fis-

cal policy coordination, enhancing debt transparency and management, strengthening the taxation of property, and improving the financial viability of the power sector, the bank had said, adding that the financing seeks to foster growth and competitiveness by reducing the cost of tax compliance, improving financial sector transparency, encouraging the use of digital payments, and promoting exports by lowering import tariffs. The bank believed that Pakistan needed urgent fiscal and structural reforms to restore macroeconomic balance and lay the foundations for sustainable growth. "RISE-II completes the first phase of tax, energy

Derek H. C. Chen said that based on the foundations laid through RISE II and parallel support by other international financial institutions, Pakistan had the opportunity to tackle long-standing structural distortions in its economy after

up foreign exchange reserves while taking measures to enhance the policy and institutional framework for improved fiscal management and regulatory conditions that support growth and competitiveness. -- ERMD

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Learning from China a must to promote sustainable development of chemical industry

Moazzam Ghurki, president of Pakistan China Joint Chamber of Commerce and Industry (PCJCCI), said during a think tank session held at PCJCCI Secretariat the other day that Pakistan does not have mature technology

industry and give full play to the industry in the national economic construction. President PCJCCI also highlighted that there is a vast potential of Pakistan in chemical manufacturing and processing. Our vision was to transform the chemical industry of Pakistan from an import-oriented to an export-oriented indus-

try. influence in the field of biochemical industry globally. Both approaches will be of great benefit to Pakistan.

Zafar Iqbal, chairman Standing Committee on Chemical Industry (PCJCCI), said that with the continuous growth of economy and population base, the demand of Pakistani citizens for chemical products is increasing day

cluster development.

Hamza Khalid, vice president PCJCCI, said that Cracker is an important link in the transfer of chemical production to downstream and upstream operations. It is significant to establish a chemical industrial park with facilities such as common effluent treatment plant, a sound supply network of



to produce petrochemical complex facilities or cracking units, which is a very big constraint to the development of its chemical industry. He stressed that Pakistan can collaborate with China and learn from China's experience to promote the sustainable development of the chemical

try. Fang Yulong, senior vice president PCJCCI, further added that with the rapid development of biotechnology, the biochemical industry has injected new vitality into the traditional chemical industry and opened up new development directions and insights. He further explained that China has a growing

water, electricity, centralized steam generating facility to reduce capital & operating expenditures for chemical manufacturers. With the promulgation of the SME Policy, Pakistani government is taking rational and challenging steps to develop SMEs for their growth. — ERMD/APP

water, electricity, centralized steam generating facility to reduce capital & operating expenditures for chemical manufacturers. With the promulgation of the SME Policy, Pakistani government is taking rational and challenging steps to develop SMEs for their growth. — ERMD/APP

OGDC

HANDS to construct climate-resilient houses in Balochistan

In continuation of its strategic collaboration for uplifting the local community, Oil and Gas Development Company Limited (OGDCL) has partnered with the Health and Nutrition Development Society (HANDS) for the construction of 84 climate-resilient houses at Umaid Ali Rawtani village of Jhal Magsi district of Balochistan province.

The transformative initiative aimed to uplift the community of Jhal Magsi in Balochistan. The groundbreaking ceremony for the construction of climate-resilient houses took place at Umaid Ali Rawtani village, marking a significant milestone in this collaborative endeavor. OGDCL and HANDS signed a memorandum of understanding

(MoU) to establish a Model Village at Umaid Ali Rawtani village in Jhal Magsi district, with a total cost of Rs. 84.929 million. OGDCL, with a Corporate Social Responsibility (CSR) focus on health, infrastructure, water supply, and environment, aims to make a positive impact on the lives of the local communities in Jhal Magsi, an area that has faced challenges of poverty and flood-related adversities.

This strategic partnership between OGDCL and HANDS lays the foundation for the construction of 84 climate-resilient houses. Each house will consist of a 15 x 15 room, a washroom, a kitchen, and a veranda, providing essential amenities for the residents. The construction is expected to be completed within a timeframe of 4 to 6 months. The initiative underscores OGDCL's commitment to social responsibility and community welfare. OGDCL remains steadfast in its dedication to sustainable development and positive societal impact. ■

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3rd HVACR Trends Exhibition & Conference A Resounding Success in Addressing Sustainability in Pharma, Hospitals, Cleanrooms

The 3rd HVACR Trends Exhibition & Conference took place in December (9th and 10th) 2023, at the prestigious Karachi Marriott Hotel, bringing together industry leaders, experts, and professionals to explore and address critical issues in the HVACR sector, with a special focus on sustainability in Pharma, Hospitals, and Cleanrooms.

Themed "Sustainability in the Critical Sectors of the Industry: Pharma, Hospitals, and Cleanrooms," the event featured an impressive lineup of tech-talks, discussions, and product displays aimed at presenting innovative solutions to challenges facing these vital sectors of the industry.

The event boasted participation from over 35 prominent companies showcasing cutting-edge HVACR products and technologies tailored for Pharma, Hospitals, and Cleanrooms. Attendees included a diverse

audience of Engineers, Technicians, Consultants, Contractors, Suppliers, Building Facilitation Managers, MEP professionals, CEOs, and other high-level staff from the healthcare sector.

The distinguished Consul General of Turkey in Karachi, H.E. Mr. Cemal Sangu, inaugurated the event, accompanied by Mr.

Product Presentations, Panel Discussions, a Product Display Expo, Networking Breakfast, and a Welcome Dinner. Renowned experts such as Wei Sun, P.E., ASHRAE Fellow; Timothy G. Wentz, PE, HBDD, Fellow; and Luke Leung, P.E., a LEED Fellow, delivered insightful presentations on cleanroom design, industry trends in 2030, and

Pakistan Society of Plumbing Professionals, and academia, were received by ASHRAE APC.

Mr. Muhammad Abbas Sajid, Chair Managing Committee of HVACR Trends, expressed his satisfaction, stating, "The event has achieved great success in bringing together the entire HVACR and Healthcare Industry to discuss relevant issues and present viable solutions. We are grateful for the support of all participants, sponsors, and partners."

The 3rd HVACR Trends Exhibition & Conference was organized by ASHRAE Pakistan Chapter and skillfully managed by BRG (Business Relay Group) Events.

ASHRAE Pakistan Chapter is a leading professional organization dedicated to the advancement of the HVACR industry, promoting sustainable practices and fostering knowledge exchange among industry professionals.

BRG Events is a premier event management company committed to delivering exceptional experiences through meticulously planned and flawlessly executed events. -- PR



Farooq Mehboob, Immediate Past President of ASHRAE, Mr. Omer Khan, President ASHRAE Pakistan Chapter (2022-23), and Mr. Muhammad Abbas Sajid, Chair Managing Committee of HVACR Trends.

Parallel events enriched the conference experience, including Technical Seminars,

healthy built environments.

Delegations from key organizations, including the Pakistan Engineering Council, Institution of Engineers Pakistan, IEEEEP, ACEP, Pakistan HVACR Society, NED University of Science & Technology, Karachi Chamber of Commerce & Industry,

NED University hosts 2 international moots with IEP, others in collaboration

'Technology Enabled Infrastructure Engineering and Management'

International Conference on Technology Enabled Infrastructure Engineering and Management (TECH-IEM) was organized by NED University in December 2023.

In Pakistan, health moni-

the two-day TECH-IEM conference Organized by NED University of Engineering and Technology in collaboration with CPEC Academic Research and Development Unit (CARDU) of Higher Education Commission, in collaboration with the Institution of Engineers Pakistan Karachi Center, under its NED University Virtual Real-

through the development of technology under the CPEC research project currently being conducted at NED, Internet of Things (IoT), virtual reality, laser scanning, and drones will be used for health monitoring of the infrastructure system and its related decision making.

On this occasion, Pakistan's Counselor to China for

of Technology.

Chairman IEP Karachi Center, Engineer Sohail Bashir was guests of honor along with Pro Vice Chancellor Prof. Dr. Muhammad Tufail and Dean CPL Prof. Dr. Asad ur Rehman. Focal Person/Co-Chair Conference Dr. Farrukh Arif emphasized

the use of modern construction technologies during the construction and maintenance phase of the Infrastructure projects. Six technical sessions were conducted at the conference. Researchers from Australia, Spain, Italy, Turkiye, USA, and national experts presented their recent

work on the subject of construction and technology. 28 papers were presented at the conference. In the closing session, Chairman Civil Engineering Professor Dr. Abdul Jabbar Sangi, keynote Speaker Prof. Dr. Mehmet Emre

Contd on page 10



toring of the infrastructure systems and decision-making will now be conducted with the help of the Internet of Things, virtual reality, laser scanning, and drones. This was stated by

Dr. Sarosh Lodi, Vice Chancellor NED University at

ity Center, collaborated by Neuro Computational Lab. The Conference was held at Mahmood Alam Auditorium, Ashraf Habibullah AV Hall, and Mechanical Hall. Patron-in-Chief of the Conference, Vice Chancellor of NED, Dr. Sarosh H. Lodi said that

Science and Technical Affairs, Khan Muhammad Wazir highlighted the importance of technology for the construction and maintenance of vast CPEC-related infrastructure.

The keynote speaker of the conference was Dr. Naveed Anwar from the Asian Institute

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Engineering, Science & Technology, Climate Change A glance at 2023

In contrast to Western billionaires' space endeavors ending in failure, India achieved an unprecedented feat. The Chandrayaan-3 mission, costing a mere \$75 million, became the world's first to reach the unexplored lunar south pole.

Although the spacecraft went dormant after two weeks of the landing, it did what it was supposed to do -- successfully detected lunar surface sulfur and demonstrated the moon's soil as an effective insulator. This accomplishment, marked by diversity, cost-effectiveness, and eco-friendly technology, hints at a transformative era in space exploration on the horizon.

Artificial Intelligence Goes Mainstream

The year 2023 emerged as the "breakout year" for artificial intelligence, with ChatGPT leading the charge. This large language model, released by OpenAI in 2022, went viral in 2023, captivating users with its fluency and encyclopedic knowledge.

AI became mainstream, with industry leaders like OpenAI and Google competing to advance generative AI.

Researchers explored AI generating content from brain scans, offering potential communication solutions for stroke and paralysis patients.

AI's role extended to conservation, aiding in tracking migrating birds through tools like BirdCast.

AI applications have the potential to not only prevent diseases and window strikes but also identify species from photographs, distinguish mushrooms, and translate whale sounds.

However ethical concerns about misinformation and bias were also raised and such concerns will likely pick up pace in the new year.

Insights into Human Migration out of Africa

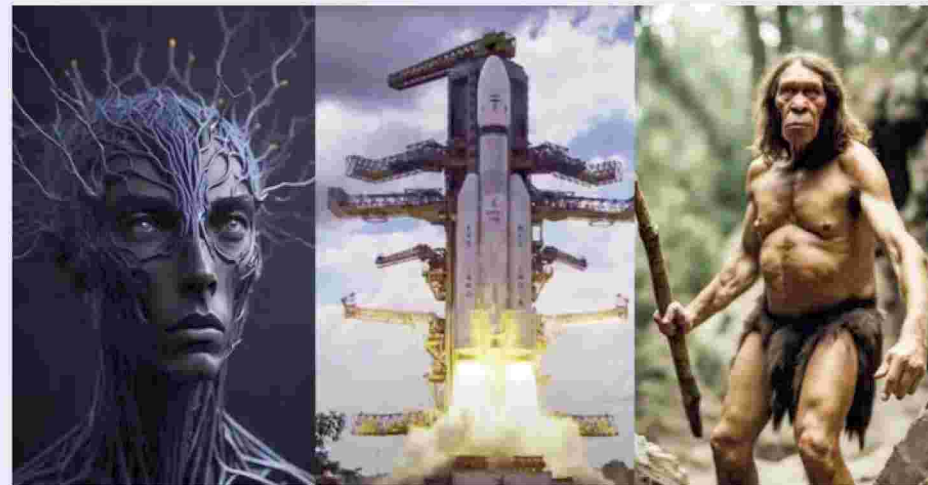
A paradigm shift in understanding our origins occurred in 2023. As Homo sapiens, our roots lie in

Africa, where our species emerged over half a million years ago.

Recent DNA analysis, led by Sarah Tishkoff at the University of Pennsylvania, revealed Neanderthal DNA in living Africans, indicating early migrations from Africa to Eurasia around 250,000 years ago.

This challenges previous notions, showcasing a more complex evolutionary history.

Additionally, research in 2023 discovered that ancient Native Americans, after venturing to North America 20,000 to 30,000 years ago, made return journeys to Eurasia.



Analysis of ten Eurasian individuals' ancient DNA revealed migrations as far as Kamchatka and central Siberia, suggesting a more intricate narrative of human movement across continents than previously understood.

These findings show the importance of exploring diverse genomic data to unravel the complexities of human history.

NASA Retrieves Asteroid Bits For Clues to Earth's Origin

NASA's OSIRIS-REx probe completed a seven-year mission, delivering 8.8 ounces of rock and dust from the asteroid Bennu in the Utah desert on September 24. Top of Form Bennu, older than Earth, may hold clues about our planet's formation and life's building blocks. Initial analysis unveiled evidence of water and high carbon content.

While OSIRIS-REx embarks on another asteroid visit, scientists on Earth are studying the Bennu sample, anticipating revelations about Earth's distant past.

The Hottest Year on Record

The year 2023 gripped the world with alarming

heat records, solidifying its status as the hottest year on record. The therapy period from April to November saw successive months of extreme heat globally. Climbing temperatures fuelled devastating natural disasters, from floods in Libya to wildfires in Canada and the United States.

Despite alarming events, positive strides include increased green energy production and advanced AI forecasting.

The COP28 climate summit witnessed global

leaders making a landmark commitment to "transition away" from fossil fuels. Yet, questions lingered about the practical implications of this pledge.

The urgent call is clear: acknowledging our role in climate change and implementing solutions is crucial for survival.

CRISPR Therapy for Sickle Cell Disease and Beta Thalassaemia

In a groundbreaking development, the UK approved the Crispr-Cas9 genome-editing tool, Casgevy, for treating sickle cell disease and beta thalassaemia.

The therapy showed promise of relieving pain and reducing the need for red-blood cell transfusions.

However, long-term effectiveness, safety issues, and the high \$2m per person cost raised concerns. Budget considerations questioned the ongoing focus on these diseases.

Despite uncertainties, the approval signifies a potential move towards healthcare equity by including overlooked groups, offering a glimmer of hope.

Weight Loss Drug Wegovy Revolutionize Health

Wegovy, initially prescribed for diabetes, emerged as a revolutionary weight-loss drug, garnering unprecedented demand.

Besides its remarkable weight-loss efficacy, early trials hinted at potential benefits like reducing heart attack and stroke risks and aiding addiction treatment. Despite criticisms of a "quick fix," and challenges in access and shortages, Wegovy marked a pivotal shift in healthcare.

Global obesity affects 650 million adults, surpassing undernourished populations at 735 million. Glucagon-like peptide-1 (GLP-1) receptor stimulants, initially for diabetes, now combat obesity.

In a two-year trial, Wegovy participants shed

Contd on page 9

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SmartNet Pvt Ltd forges fiber lease deal with One Network, Cybernet

Islamabad-SmartNet Private Limited, the technology arm of Capital Smart City and a key entity in the HRL Group of Companies is pleased to announce a groundbreaking Fiber Lease

Agreement in collaboration with One Network and Cybernet.

This partnership enables SmartNet to deliver terabytes of data every second to Capital Smart City, Lahore Smart City, and affiliated projects on motorways. The high-speed connectivity strengthens Capital Smart City's posi-

tion as a technological leader, enhancing capabilities in IoT, Big Data, Artificial Intelligence, and advanced technologies.

In addition to supporting Silicon Valley connectivity and motorway projects, SmartNet aims to contribute significantly to Digital Pakistan, promoting technology exports.



the revolution in digital infrastructure and urban development. "We believe this collaboration will enhance the technological landscape of Capital Smart City and contribute significantly to broader digital transformation in urban development," added General Manager Technology, M Shahzad Khalil. -- PR

The establishment of an incubation centre demonstrates a commitment to fostering innovation and technological entrepreneurship. "We are excited to embark on this transformative journey with our partners, One Network and Cybernet," said Brig (retd) Arshad Kayani, CTO, SmartNet Private Limited.

the revolution in digital infrastructure and urban development. "We believe this collaboration will enhance the technological landscape of Capital Smart City and contribute significantly to broader digital transformation in urban development," added General Manager Technology, M Shahzad Khalil. -- PR

Pakistan, Saudi recruitment firms sign pacts to recruit Pakistanis for ongoing projects in Kingdom

Pakistan has signed agreements with multiple Saudi recruitment agencies for the recruitment of Pakistani professionals for ongoing mega projects in the

opportunities for the Pakistani workforce in the Kingdom, according to the ministry of overseas Pakistanis. The visit is focused on major mega development

Saudi Arabia's The First National Company (FNRCO), Maharah Human Resources and other firms last month. Malik said another letter

KSA for enhancing our participation for the Saudi 'Vision 2030'." During the visit, the PM's aide held a detailed exchange of views with

bia have deep cultural, defense and economic ties, deeply rooted in history and religion. The Kingdom is home to over two million Pakistanis, making it the

gic development framework intended to cut the Kingdom's reliance on oil, and foster a strong partnership for mutual benefit, according to the Pakistani ministry.



Kingdom.

The pacts were signed during Pakistan prime minister's aide on overseas Pakistanis Jawad Sohrab Malik's visit to Saudi Arabia, aimed at fostering collaboration and exploring employment

projects that are set to open vast employment avenues for unskilled professionals in general and for skilled professionals in particular from Pakistan. The agreements were signed between Pakistan and

of intent (LoI) was signed with Maharah Human Resources in Riyadh this week. "InShaAllah there will be enhanced employment opportunities for Pakistani workforce. All gratitude to the

Saudi employers and highlighted the importance of human resource development as per requirements of the Saudi market and economy, according to the ministry of overseas Pakistanis. Pakistan and Saudi Ara-

largest contributor to remittance inflows into the South Asian country. Malik's visit aimed to align Pakistan's workforce with Saudi Arabia's economic transformation program under Vision 2030, a strate-

It also aimed to enhance crucial remittances, contributing to the stability of Pakistan's economy and supporting the economic well-being of families that rely solely on these financial inflows. - AN/ERMD



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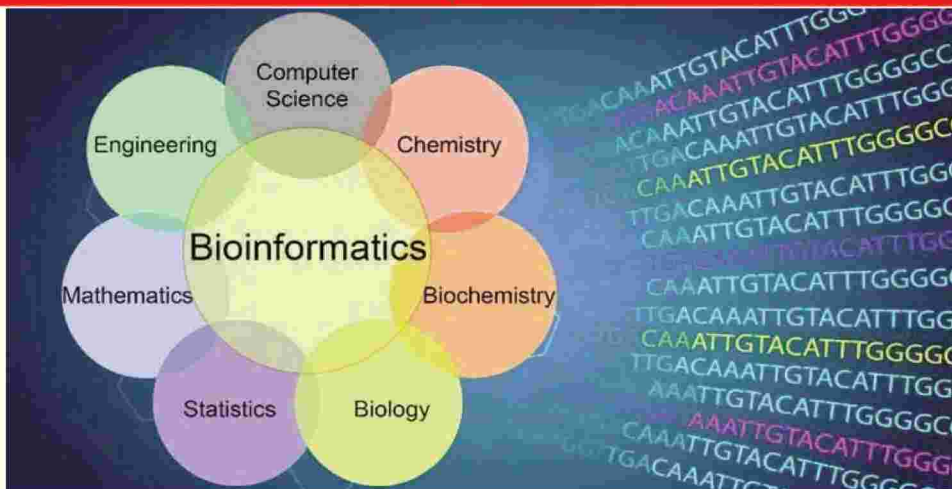
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Applications and Techniques of Computational Biology

Engr. Dr. Muhammad Nawaz Iqbal

In order to comprehend biological systems and relationships, computational biology uses data analysis, mathematical modelling, and computer simulations. The area has roots in applied mathematics, chemistry, and genetics and is a nexus of computer science, biology, and big data. Biological computing, a branch of computer engineering that applies bioengineering to the construction of computers, is distinct from it. An in silico experiment is one that is carried out on a computer or through computer simulation in biology and other experimental sciences. Pseudo-Latin for "in silicon," the phrase alludes to the silicon found in computer chips. It was first used in biology in 1987 as an allusion to the Latin terms *in vivo*, *in vitro*, and *in situ*. The latter expressions refer to trials carried out on live things, apart from living things, and in natural



settings, respectively. Building computer models and visual simulations of biological systems is referred to as computational biomodeling, and it is one of the expanding research disciplines enabled by the collection and analysis of huge datasets. In order to ascertain whether a system can "keep their state and functions against external and internal perturbations," researchers can utilise this information to forecast how such systems would respond to various settings. While present methods

concentrate on tiny biological systems, scientists are developing strategies that will enable the analysis and modelling of bigger networks. The study of the genomes of cells and other organisms is known as computational genomics. Computational genomics includes, as one example, the Human Genome Project. In this effort, the entire human genome will be sequenced and converted into a set of data. Once fully deployed, this might make it possible for medical professionals to examine a patient's

genome. This creates the opportunity for personalized medicine, which would involve treating patients according to their unique genetic profiles. The genomes of all living things, including bacteria, plants, and animals, are being sequenced by researchers.

The random forest algorithm, which employs many decision trees to train a model to categorize a dataset, is a popular supervised learning technique. A decision tree is a structure that serves as the foundation for the random forest and seeks to categorize or label a piece of data using certain well-known attributes of that data. A medical application of this would be the use of genetic information to determine a per-

son's propensity to develop a particular disease or cancer. The method checks the dataset at each internal node for exactly one feature, in the previous example a particular gene, and then branches left or right based on the outcome.

All three interdisciplinary approaches to the life sciences—computational biology, bioinformatics, and mathematical biology—draw on quantitative fields like information science and mathematics. In contrast to bioinformatics, which uses information science to comprehend complex life-sciences data, computational/mathematical biology is defined by the National Institutes of Health as the application of computational/mathematical approaches to address theoretical and experimental questions in biology.

Although they share a name, the concepts of computational biology and evolutionary computation should not be conflated. Evolutionary computation, in contrast to computational biology, does not model or analyse biological data. Instead, it develops algorithms based on theories of interspecies evolution. The study in this area, which is also known as genetic algorithms, has applications in computational biology. Although computational evolutionary biology is a subfield of computational biology, evolutionary computation is not always a component of it. ■



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NUST unveils Heydar Aliyev Auditorium

The National University of Sciences & Technology (NUST) proudly unveiled the Heydar Aliyev Auditorium, a tribute to the visionary national leader of Azerbaijan, on the occasion of the centenary of his birth.

the Embassy of Azerbaijan, highlighted the life and diplomatic contributions of Heydar Aliyev, emphasizing his exceptional role in safeguarding and advancing Azerbaijan's independence.

During the ceremony, Ambassador Farhadov expressed gratitude for the enduring friendship between Pakistan and Azerbaijan, acknowledging the

stands as a testament to the strong bonds between Azerbaijan and Pakistan, symbolizing the shared commitment to education, culture, and diplomacy. Dr. Rizwan Riaz, Pro-Rector Research, Innovation & Commercialization (RIC) NUST, also highlighted the significant partnership between the two countries and the role of NUST in building mul-



Distinguished guests, including Ambassador Khazar Farhadov of Azerbaijan, diplomats from various nations, government officials and esteemed university faculty and students gathered for the official inauguration ceremony at NUST Business School (NBS).

unwavering diplomatic support from the people and government of Pakistan, particularly during the Karabakh war. He emphasized the historic ties between the two nations, noting that Pakistan was the first country to recognize Azerbaijan, fostering historic public relations. The Heydar Aliyev Auditorium

multiple avenues of collaboration across universities in Azerbaijan and Pakistan. He was confident that the Heydar Aliyev Auditorium would serve as a focal point for cultural exchange and educational collaboration, embodying the enduring legacy of the great national leader for decades to come. - PR

The event, hosted by

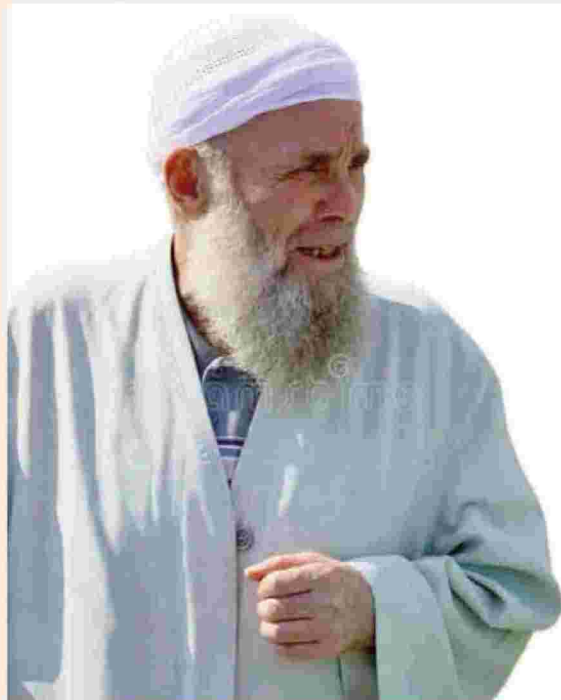
Sales blog for our young engineers and entrepreneurs!

A glance at 2023

Our ancestors

Muhammad Tariq Huq | ESL

Once upon a time, there lived a young man affectionately called Babu. Babu had recently migrated from India to Pakistan after the partition, seeking a safe and secure life for himself and his family.



In the process, he lost his parents, wealth and business! He faced many other challenges also. Due to scars left by bloody riots, he lacked confidence, and had a stutter and a fear of unknown, which made him an easy target for ridicule by others. One day, Babu came

across a quote that changed his life. It said, "When God is with you, nobody can be against you." Inspired by these words, Babu started to research how can God be with him? One day he found the verse "Surely Allah is with those who shun evil and who do good deeds" (16:128)! Babu decided to live by this verse of God and prove everyone

wrong. Shortly after his arrival in Pakistan, Babu faced another setback. He went for a job interview in sales, hoping to start a new career, but the recruiter dismissed him, saying he had no chance of succeeding. The recruiter pointed out that Babu had no experience of the Pakistan market and claimed his business English wasn't good enough. Instead of feeling defeated, Babu used this rejection as fuel for his determination. He believed that sales was not just about words, but also about passion and character. He knew he could prove himself if given the chance. He started his job search with renewed

vigor. He spent hours researching sales techniques, improving his business English skills, and building his confidence, enthusiasm and smiling appearance. Despite facing numerous rejections, he never gave up. He knew that every "no" brought him closer to a "yes." He soon

found a job in a Dining Car Service company! It gave him a sense of accomplishment and pride. Unfortunately, the company was shut down in the wake of IndoPak war in 1965. Soon he found a lucrative sales job in a pharmaceutical company and continued there till his retirement! He raised a family of eleven children whom he educated well to become Doctors and Engineers! His house was considered to be an epitome of knowledge converting numerous ordinary boys and girls into brilliant students and professionals! Babu's story teaches us an important lesson. When someone tells you that you can't do something, it is often a reflection of their own limitations, not yours. His success was a testament to his own motivation, commitment and trust in God, not his accent or stutter or large family members. Dear readers, story of Babu teaches that you are as good as your own character and a hundred hours of hard work per week. Don't let anyone's doubts hold you back. Believe in yourself and you can overcome any obstacle. The rut is only mental; the disability is in the mind only, it is not physical and that if through your character, you can get God on your side, nobody can be against you! This is similar to the story of most of our own ancestors; who settled in Karachi and made it the main revenue generator for the whole country! May Allah rest our ancestors in eternal peace! — and make Karachi continue to contribute to the national exchequer through salesmanship of its upright people. This is a legacy they have inherited from their great ancestors! ■

Contd from page 7
15% body weight, dwarfing the control group's 3%.

However, Wegovy's side effects, like nausea and a potential risk of thyroid cancers, caution against unbridled optimism. Addressing starvation remains an unresolved challenge.

Bird Decline Linked to Herbicides and Pesticides

This year marks a record-breaking environmental crisis, notably the alarming decline in global wildlife alongside the pervasive issue of global heating. Unfortunately, the biodiversity crisis receives significantly less attention than the climate emergency, despite its severity.

A study revealed a shocking decline of 550 million birds across Europe over four decades.

Previously attributed to habitat loss and pollution, a comprehensive study by Stanislas Rigal's team identifies agricultural intensification, driven by increased pesticide and fertilizer use, as the primary culprit.

The findings emphasized the urgent need for policy changes to mitigate biodiversity loss.

Hope for Stem Cell-based Embryo Models

June witnessed a surge in scientific interest as researchers demonstrated the ability to cultivate structures resembling early post-implantation human embryos entirely within a culture dish, using pluripotent stem cells.

The experiments garnered significant media attention,

emphasising the remarkable ability of stem cells to self-organise into relevant tissues.

While hailed for potential breakthroughs in understanding human development and addressing reproductive challenges, there's a consensus that these stem cell-based embryo models, while promising, aren't equivalent to natural embryos.

A critical test, implantation into a womb, remains uncharted territory, with 99% of cultured aggregates failing to resemble a human embryo.

Ethical considerations and the need for improved efficiency highlighted the journey toward using these models.

Wildfires Bum Through Canada and Hawaii

Devastating wildfires set records in 2023, particularly in Canada, where over 45 million acres succumbed to flames by October—more than double the previous record set in 1989.

These infernos, covering vast areas, unleashed massive clouds, akin to those over volcanoes, causing lightning and high winds. The repercussions extended globally, with June witnessing the worst air quality in parts of the US, affecting Spain, Britain, and Norway.

Additionally, a catastrophic blaze on Hawaii's Maui Island claimed at least 100 lives, marking the highest US wildfire death toll in a century.

This alarming trend, fuelled by climate change, transforms once-extreme fires into a disturbing norm across the planet. - ERMD

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NED University hosts 2 international moots with IEP, others in collaboration

Contd from page 9 from the School of Construction and Design of America, and other experts gave examples of smart maintenance and operations, laser scanning, automatic robots, drones, virtual reality, 5G and Internet of things, and how these technologies can contribute to improving the infrastructure industry, and help in increasing efficiency. They emphasized that with the help of technology in modern times, the overall construction and maintenance projects can also be improved in addition to comparing the construction performance. Conference Secretary Dr. Shamsun Farid thanked the experts and audience at the end.

“Forewarned is Forearmed: Construction Disputes Avoidance and Resolution”

The International Seminar on “Forewarned is Forearmed: Construction Disputes Avoidance and Resolution”, was held in Decemr 2023 too at NED University.

Over 200 professionals from the construction industry and legal fraternity participated in the seminar.

The Institution of Engineers Pakistan (IEP) Karachi Centre, Chartered Institute of Arbitrators (CI Arb) Pakistan Branch, Asian Civil Engineering Coordination Council (ACECC) Future Leaders Forum collaborated for the program. Prof. Dr. Asad Ur Rehman Khan, Dean of Civil and Petroleum Engineering, NED University welcomed the participants. This was followed up by the address of Barrister Mian Sheraz Javed, Chairman Chartered Institute of Arbitrators (CI Arb) Pakistan Branch.

Engr. Nasir Khan MBE, Principal a HKA, UK and Chair of Construction Industry Council UK (liability panel) made a technical presentation on "FOREWARDN IS FOREARMED -

Anticipating Challenges, Mitigating Risk", while Dr. Farrukh Arif. An associate professor at NED University presented his teams' work regarding "Practices and effectiveness on

Barrister Mian Sheraz Javaid, Engr, Nasir Khan MBE, and Ms. Navin Merchant from Merchant Law Associates as the panelists. The panelists deliberated ways through which Con-

Honourable Chief Justice of Sindh High Court Mr. Justice Aqeel Ahmed Abbasi graced the occasion as the Chief Guest. Engr. Sohail Bashir, Chairman IEP, Karachi Centre,

formally welcomed the distinguished guests and provided an overview of the objectives of the seminar. Dr. Sarosh H. Lodi, Vice Chancellor NED University in his address highlighted the efforts of NED University to provide and upgrade quality human resource capacity in the area of construction engineering law. He specifically highlighted the integration of construction law courses in Civil Engineering and Construction Engineering degrees at the undergraduate level, while providing insights into M.Engg. (Civil) Construction Engineering Law degree being offered by NED University and its impact on the profession being the only construction law program in Pakistan. In his address, Honourable Mr. Justice Zulfiqar Ahmad Khan, stressed the efforts to improve arbitration practices, ways to strengthen the arbitration regulations, and the importance of intellectual property and professional ethics in the construction law profession.

On this occasion, a MoU was also signed between NED University and the Chartered Institute of Arbitrators Pakistan Branch for collaboration in education, research, and professional development in the area of Construction law with CI Arb recognizing the M.Engg. The Construction Engineering Law program, being offered at NED University as its qualifying requirement for direct associate membership grade. ■



arbitration as ADR mechanism in the construction industry of Pakistan."

The technical session was followed by a panel discussion moderated by Engr. Sohail Bashir, Chairman IEP Karachi Centre, with

construction Arbitration became a successful ADR mechanism in Pakistan.

On this occasion, Mr. Justice Zulfiqar Ahmad Khan, Honourable Judge of Sindh High Court was the Guest of Honour, and

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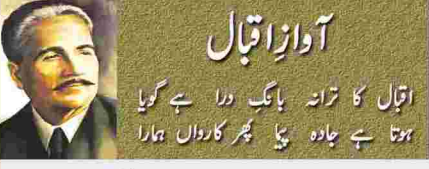
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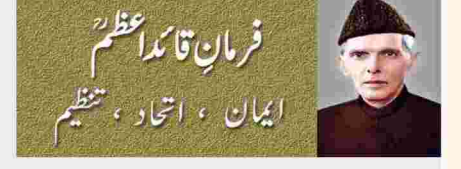
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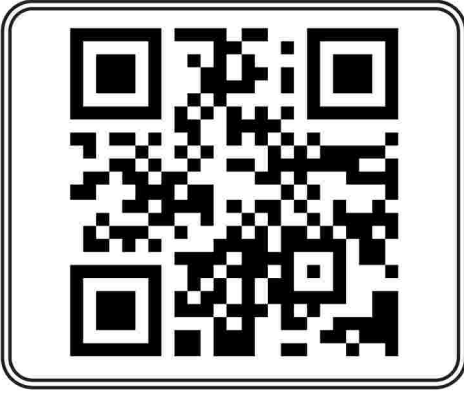
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ایک اندازے کے مطابق پاکستان میں توانائی کی طلب میں 2030ء تک آٹھ گنا اور 2050ء تک بیس گنا اضافہ متوقع ہے۔ ایسے میں سولر انرجی کے وسائل کو استعمال کرنا بہت ضروری ہو جاتا ہے کیونکہ پاکستان جغرافیائی طور پر اس خطے میں واقع ہے جہاں سال بھر سورج کی روشنی موجود رہتی ہے۔ پاکستان کا جغرافیہ اور ماحولیاتی حالات سولر انرجی کے زیادہ سے زیادہ استعمال کی لیے مثالی ہیں۔ توانائی کے بحران کو نسبتاً کم وقت میں حل کرنے کیلئے بھی سولر انرجی انتہائی اہم ہے کیونکہ سولر پلانٹس اور پاور پلانٹس کوئی فضائی آلودگی یا گرین ہاؤس گیس پیدا نہیں کرتے بلکہ سولر انرجی کے استعمال میں اضافے اور دیگر ذرائع سے پیدا ہونے والی بجلی کے استعمال میں کمی سے ماحول پر مثبت اثر پڑتا ہے۔

شہریوں کیلئے بجلی کے بلوں کی ادائیگی سب سے بڑا معاشی مسئلہ بن چکی ہے۔ یہ صورتحال ایک دن میں پیدا نہیں ہوئی بلکہ یہ گزشتہ تین دہائیوں کی بدانتظامی اور غلط پالیسیوں کا خمیازہ ہے جسے ہم آج بھگت رہے ہیں۔ سرکاری اعداد و شمار کے مطابق ملک میں بجلی کی مجموعی پیداواری استعداد 41 ہزار میگا واٹ ہے جس میں 10 ہزار 592 میگا واٹ ہائیڈرو، 24 ہزار 95 میگا واٹ تھرمل، 3503 میگا واٹ نیوکلیئر اور 2783 میگا واٹ بجلی دیگر ذرائع سے حاصل ہوتی ہے۔ تاہم اگست 2023ء کے دوران بجلی کی زیادہ سے زیادہ پیداوار کا حجم 25 ہزار 516 میگا واٹ ریکارڈ کیا گیا جو کہ ہماری مجموعی پیداواری استعداد سے تقریباً 15 ہزار 500 میگا واٹ کم ہے۔ اس صورتحال کا ایک اور پہلو یہ ہے کہ سردیوں کے موسم میں بجلی کی زیادہ سے زیادہ ضرورت 10 سے 12 ہزار میگا واٹ تک محدود ہو جاتی ہے یعنی ہماری مجموعی پیداواری استعداد کی 75 فیصد سے زائد بجلی کا کوئی مصرف نہیں رہتا۔

دوسری طرف نیشنل الیکٹرک پاور ریگولیٹری اتھارٹی (نپرا) کے اعداد و شمار کے مطابق جولائی 2023ء میں فرنس آنکل پرنٹی پلانٹس سے پیدا ہونے والی بجلی کی قیمت 28.7 روپے فی یونٹ تھی۔ اسی طرح درآمدی مائع قدرتی گیس (ایل این جی) کی مدد سے پیدا ہونے والی بجلی 24.4 روپے فی یونٹ فروخت کی گئی۔ علاوہ ازیں ایران سے درآمد کی جانے والی بجلی کی قیمت بھی 10 روپے فی یونٹ سے بڑھ کر 23.6 روپے فی یونٹ ہو گئی۔ اسی طرح مقامی گیس کے ذریعے بجلی پیدا کرنے کی لاگت میں بھی 100 فیصد سے زیادہ اضافہ ہوا ہے جس کی وجہ سے اس کی قیمت پانچ روپے فی یونٹ سے بڑھ کر 13.6 روپے فی یونٹ ہو گئی جبکہ کونسل سے بننے والی بجلی کی قیمت 11.5 روپے فی یونٹ رہی۔ بجلی پیدا کرنے والے تمام ذرائع میں سب سے سستی بجلی نیوکلیئر پاور پلانٹس سے حاصل ہوتی ہے جس کی فی یونٹ قیمت 1.16 روپے ہے۔

نپرا کے مطابق تمام ذرائع سے پیدا ہونے والی بجلی 8.96 روپے فی یونٹ کے حساب سے بجلی کی تقسیم کار کمپنیوں کو فراہم کی گئی۔ تاہم بجلی کی تقسیم کار کمپنیوں کی جانب سے بجلی چوری، لائن لاسز، سرکاری ملازمین کو فراہم کی جانے والی مفت بجلی اور پاور پلانٹس کو کپیسٹی جیمینٹس کی مدد سے جانے والی ادائیگیوں کا بوجھ صارفین پر ڈال کر بجلی کے نرخ دس روپے فی یونٹ سے بڑھا کر 30 سے 50 روپے فی یونٹ کر دیئے گئے ہیں۔ یہ اعداد و شمار اس بات کی غمازی کرتے ہیں کہ بجلی کی پیداواری لاگت، بجلی چوری اور لائن لاسز جتنے زیادہ بڑھیں گے اس کا اتنا ہی زیادہ بوجھ گھریلو اور صنعتی صارفین کو برداشت کرنا پڑے گا۔ ان حالات کو دیکھتے ہوئے صنعتکاروں نے بجلی کے بھاری بلوں سے بچنے کے لئے شام پانچ بجے کے بعد سرکاری بجلی کا



پاکستان بھاشا ڈیم کے لیے 1 ارب ڈالر کا فوری انتظام کرنے کیلئے کوشاں

نگران وزیر اعظم کے حالیہ دورہ کویت کے دوران معاہدے پر دستخط، منصوبے کے لیے سرمائے کے حصول میں مدد ملے گی

ڈیم کیلئے 3.5 ارب ڈالر درکار، مستقبل قریب میں ایک ارب ڈالر کی ضرورت ہے، ذرائع پاکستان دیامر بھاشا ڈیم کیلئے فاسٹ ٹریک بنیادوں پر ایک ارب ڈالر کا انتظام کرنے کیلئے کوشاں ہے۔ ذرائع نے بتایا کہ بھاشا ڈیم کی تکمیل کیلئے تقریباً ساڑھے 3 ارب ڈالر درکار ہیں جن میں سے ایک ارب ڈالر کی مستقبل قریب میں ضرورت ہے۔ نگران وزیر اعظم انوار الحق کا کڑے حالیہ دورہ کویت کے دوران اس پراجیکٹ کیلئے فنڈز اکٹھے کرنے کیلئے کویتی حکومت کے ساتھ معاہدے پر دستخط کیے گئے ہیں۔ ذرائع کے مطابق کویت کے ساتھ سرمایہ کاری میں تعاون کے معاہدے سے غازی برو تھاباؤنڈی پراجیکٹ میں ایکویٹی شمولیت کے ذریعے بھاشا ڈیم کیلئے سرمائے کے حصول میں مدد ملے گی۔ پاکستان بھاشا ڈیم کیلئے فنڈز کے حصول کیلئے ایک عرصہ سے کوشاں ہے تاہم

ملک بھر میں آسمانی بجلی کی اطلاع دینے والے 25 لائٹنگ ڈیٹیکٹرز نصب کیے جائیں گے

منصوبے کے تحت ملک بھر میں 25 لائٹنگ ڈیٹیکٹرز نصب کیے جائیں گے، کراچی سمیت دیہی سندھ میں 6 لائٹنگ ڈیٹیکٹرز نصب ہوں گے

ڈیٹیکٹرز سے بارشوں کے سسٹم کی گرج چمک کے دوران بالا فضوں میں تشکیل پانے والی آسمانی بجلی کی شدت کا اندازہ لگایا جاسکے گا

کراچی سمیت دیہی سندھ کے مختلف اضلاع میں آسمانی بجلی کی اطلاع دینے والے 6 لائٹنگ ڈیٹیکٹرز نصب کیے جائیں گے، کراچی میں بیک وقت ایک شارٹ اور ایک لائٹ رینج ڈیٹیکٹر نصب کیا جائے گا جو سمندر کی جانب سے آسمانی بجلی گرنے کے واقعات کی جانکاری کا حامل ہوگا۔ منصوبے کے تحت ملک بھر میں 25 لائٹنگ ڈیٹیکٹرز نصب کیے جائیں گے، آسمانی بجلی گرنے کے واقعات کا جمع کردہ ڈیٹا مستقبل میں غیر معمولی موسمیاتی حالات کے دوران معاون ثابت ہوگا، چین کی طرف سے تحفے میں دیے گئے آلات انسٹیٹیوٹ آف الیکٹریکل انجینئرنگ جاپانیز اکیڈمی آف سائنسز نے تیار کیے ہیں، ماریٹ 28 کروڑ روپے سے زائد ہے۔ موسمیاتی تغیر (کلائمٹ چینج) کی وجہ سے غیر معمولی سرگرمیوں مثلاً از مین وسط سمندر کی حدت بڑھنے، طوفانوں میں اضافے اور آسمانی بجلی گرنے کے بڑھتے واقعات بھی شامل ہیں۔ ماضی قریب و بعد میں تیز بارشوں کے دوران تھرپاکر میں بجلی گرنے کے متعدد



آسمانی بجلی کے تشکیل پانے والے شدت کا اندازہ لگایا جاسکے گا۔ محکمہ موسمیات کے ڈیپٹی ڈائریکٹر عرفان ورک کے مطابق آسمانی بجلی کی پیش گوئی کرنے والے آلات چین کی طرف سے تحفے میں دیے گئے ہیں، مذکورہ آلات ریڈیو فریکوئنسی وی ایل ایف (ویراو فریکوئنسی) کے حامل ہیں جن کو انسٹیٹیوٹ تعین اور بجلی گرنے کے امکانات کا احاطہ کر سکے گا۔ 100 مربع کلومیٹر میں آسمانی بجلی کے گرنے کی پیشگی اطلاع دے سکتا ہے، اب تک پاکستان میں آسمانی بجلی گرنے کی پیشگی اطلاع کا جدید نظام موجود نہیں تھا، ان آلات کی قیمت 10 لاکھ امریکی ڈالر (28

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سندھ میں گیس کی دریافت، غازی تاج ٹوکوں سے پیداوار شروع

غاز تاج 2 سے یومیہ 18 ایم ایم سی ایف ڈی گیس فراہمی، توانائی کی طلب پوری ہوگی

ڈہری غازی تاج ٹوکوں کی گیس سے زرمبادلہ ذخائر کی بھی بچت ہوگی، حکام ماٹری پیٹرولیم

ماٹری پیٹرولیم کے غازی تاج ٹوکوں سے گیس کی پیداوار شروع ہوگئی، پیٹرولیم کی مقامی کمپنی کے ڈہری میں قائم ٹوکوں غازی تاج سے بھی گیس دریافت ہوگی، گزشتہ ماہ غازی تاج ون ٹوکوں سے گیس دریافت کی گئی تھی، غازی تاج ٹوکوں سے سوئی ناردرن کو یومیہ آٹھ ایم ایم سی ایف ڈی گیس فراہمی کی جارہی ہے، حکام کی جانب سے جاری بیان میں کہا





Artificial intelligence can predict events in people's lives

Artificial intelligence developed to model written language can be utilized to predict events in people's lives.

A research project from DTU, University of Copenhagen, ITU, and Northeastern University in the US shows that if you use large amounts of data about people's lives and train so-called 'transformer models', which (like ChatGPT) are used to process language, they can systematically organize the data and predict what will happen in a person's life and even estimate the

time of death.

In a new scientific article, 'Using Sequences of Life-events to Predict Human Lives', published in Nature Computational Science, researchers have analyzed health data and attachment to the labour market for 6 million Danes in a model dubbed life2vec.

After the model has been trained in an initial phase, i.e., learned the patterns in the data, it has been shown to outperform other advanced neural networks (see fact box) and predict outcomes such as personality and time of death with high accuracy.

"We used the model to address the fundamental question: to what

extent can we predict events in your future based on conditions and events in your past? Scientifically, what is exciting for us is not so much the prediction itself, but the aspects of data that enable the model to provide such precise answers," says Sune Lehmann, professor at DTU and first author of the article.

Predictions of time of death

The predictions from Life2vec are answers to general questions such as: 'death within four years'?

When the researchers analyze the model's responses, the results are consistent with existing findings within the social

sciences; for example, all things being equal, individuals in a leadership position or with a high income are more likely to survive, while being male, skilled or having a mental diagnosis is associated with a higher risk of dying.

Life2vec encodes the data in a large system of vectors, a mathematical structure that organizes the different data.

The model decides where to place data on the time of birth, schooling, education, salary, housing and health.

"What's exciting is to consider human life as a long sequence of events, similar to how a sentence in a language consists of a series of words. This is

usually the type of task for which transformer models in AI are used, but in our experiments we use them to analyze what we call life sequences, i.e., events that have happened in human life," says Sune Lehmann.

Raising ethical questions

The researchers behind the article point out that ethical questions surround the life2vec model, such as protecting sensitive data, privacy, and the role of bias in data.

These challenges must be understood more deeply before the model can be used, for example, to assess an individual's risk of contracting a dis-

ease or other preventable life events.

"The model opens up important positive and negative perspectives to discuss and address politically. Similar technologies for predicting life events and human behaviour are already used today inside tech companies that, for example, track our behaviour on social networks, profile us extremely accurately, and use these profiles to predict our behaviour and influence us. This discussion needs to be part of the democratic conversation so that we consider where technology is taking us and whether this is a development we want," says Sune Lehmann. -- SD

Ecosystem benefits to humanity expected to decline by 9% by 2100



As climate change redistributes terrestrial ecosystems across the globe, the world's natural capital is expected to decrease, causing a 9% loss of ecosystem services by 2100.

That's according to a study of natural capital published in the journal *Nature* led by scientists at the University of California, Davis, and Scripps Institution of Oceanography at UC San Diego.

Breathable air, clean water, healthy forests and biodiversity all contribute to people's well-being in ways that can be very difficult to quantify.

"Natural capital" is the concept scientists, economists and policymakers use to represent the current and future flow of benefits the world's natural resources bring to people.

"The big question is what do we lose when we lose an ecosystem?" said lead author Bernardo Bastien-Olvera, a doctoral

student at UC Davis when the study was conducted and currently a postdoctoral fellow at Scripps.

"Flipping the question: What do we gain if we are able to limit climate change and avoid some of its impacts on natural systems? This study helps us better consider damages not usually accounted for. It also reveals an overlooked, yet startling dimension of climate change effects on natural systems -- its capacity to exacerbate global economic inequality."

Profound inequalities

When countries lose natural capital, their economies suffer.

The study found that, by 2100, climate change-induced changes to vegetation, rainfall patterns and higher CO₂ result in an average 1.3% reduction in gross domestic product, or GDP, across all the countries analyzed.

It further found profound inequalities in the distribution of these impacts.

"Our research found that the world's poorest 50% of countries and regions are expected to bear a staggering 90% of the GDP dam-

ages," Bastien-Olvera said.

"In sharp contrast, the losses for the wealthiest 10% might be limited to just 2%."

The authors said this is largely because lower-income countries tend to rely more on natural resources for their economic production, and a larger fraction of their wealth is in the form of natural capital.

Natural and economic values

For the study, the authors used global vegetation models, climate models and World Bank estimates of natural capital values to estimate the consequences of climate shifts on countries' ecosystem services, economic production and natural capital stocks.

These estimates may be conservative, as the analysis considered only land-based systems -- primarily forests and grasslands.

Bastien-Olvera plans to address marine ecosystem impacts in future research.

The study also didn't account for disturbances like wildfires or insect-driven tree mortality.

Accounting for nature

The overall findings underscore the importance of creating climate policies that account for the particular values each country derives from its natural systems.

"With this study, we're embedding natural systems and human well-being within an economic framework," said senior author Frances C. Moore, an associate professor in the UC Davis Department of Environmental Science and Policy.

"Our economy and well-being depend on these systems, and we should recognize and account for these overlooked damages when we consider the cost of a changing climate."

The study was funded by the National Science Foundation.

"Thanks to the efforts of this research team, we now know that damage to ecosystems impacts human well-being in ways that are both measurable and wildly disproportionate across populations," said Jeffrey Mantz, NSF program officer. "The results will be critical to abating economic losses in the coming decades." -- SD

A trillion scents, one nose

The mammalian nose is a work of evolutionary art.

Its millions of nerve cells, each tailored with just one of thousands of specific odor-chemical receptors encoded in the genome, can collectively distinguish a trillion distinct scents. Those sensations, in turn, inform many behaviors, from assessing food options to discerning friends from foes to sparking memories.

Today, in the journal *Nature*, a research team led by scientists at Columbia's Zuckerman Institute describes a previously undetected mechanism in mice -- starring the genetic molecule RNA -- that could explain how each sensory cell, or neuron, in mammalian noses becomes tailored to detect a specific odor chemical.

For example, there are sensory neurons in our noses that bear receptors uniquely tuned to detect ethyl vanillin, the main odorant in vanilla, and other cells with receptors for limonene, lemon's signature odorant.

"How sensory cells in the nose make their receptor choices has been one of the most vexing mysteries about olfaction," said Stavros Lomvardas, PhD, a Roy and Diana Vagelos Professor and Chair of Biochemistry and Molecular Biophysics and Herbert and Florence Irving Professor of Neuroscience at

Columbia's Zuckerman Institute and the Vagelos College of Physicians and Surgeons, and corresponding author on the paper.

"Now, the story behind our sense of smell, or olfaction, is becoming clearer, and also more dramatic."

The sense-refining drama he is referring to unfolds entirely within the minuscule confines of each olfactory neuron's nucleus, where the cell's chromosomes and genes reside.

There, in a *Squid Games*-style, winner-takes-all competition, a developing cell's myriad olfactory receptor genes vie with each other in a process that winnow them down, in stages, first to handful of finalists and then to a single winner.

The prevailing gene is the one that determines the cell's odorant sensitivity.

In their study, Dr. Lomvardas and his team uncover details of the final stage of this process when the winner emerges from the finalist genes.

"It's basically a battle between a 1000 contenders," said Ariel Pourmorady, the paper's first author and an M.D.-Ph.D. candidate at the Zuckerman Institute in the Lomvardas lab.

The action is exceedingly complex and involves a dizzying cast of molecular characters.

Playing roles that either dial up or down each gene's ability to produce olfactory recep-

tors are a variety of gene-regulating molecules.

By gathering into various alliances within the genome, these molecular players help turn specific genes on or off.

Also in the fray is another set of molecular hubs that reshape portions of the genome in ways that favor specific receptor genes.

When his team first observed these in the genome in 2014, Dr. Lomvardas dubbed them "Greek Islands" because they reminded him of islands in the Aegean Sea.

"It turns out that the genome has a certain spatial organization in the nucleus and changes in this structure are pivotal when it comes to which genes are expressed into proteins, like olfactory receptors," said Pourmorady.

"We are learning just how important this process is within maturing olfactory cells."

In their new *Nature* paper, the researchers summon a trove of data from mouse studies pointing toward RNA as the linchpin molecule in the olfactory system's gene-choosing mechanism.

RNA is most known as the go-between molecule that translates the genetic code embodied in DNA into protein molecules with specific cellular jobs, like detecting odorants.

Using sophisticated techniques for analyzing changes in genome structure as cells mature, however, the researchers say their evidence



points to a pivotal second role for the RNA.

"It looks like the RNA the cell makes during gene expression also is altering the genome's architecture in ways that bolster the expression of one olfactory receptor gene while also shutting down all the others," Pourmorady said.

Big gaps in this genome-controlling story remain, but the researchers say the outline is becoming more defined. It starts with maturing olfactory cells, which initially express many receptor genes at those genomic hubs where gene-regulating molecules and complexes, including Greek Islands, converge.

Then the RNA winnows the contending olfactory-receptor genes down to one.

The particular hub in each cell where the molecular stars align to produce the highest amount of RNA wins the competition.

At this hub, receptor-gene expression soars. But, like a slinky saboteur, RNA from that same hub may wind its way to all the other hubs.

In those locations, the RNA causes shape changes in the genome that shut down gene expression.

The result is a nose's worth of mature olfactory neurons, each of which bears on its surface only one odorant receptor. -- SD