

ROBOTICS



The world has seen many technological marvels but none of them have been as helpful as the advent of the robotics industry. Besides robots that help in small-scale commercial activities, industrial robots have been playing a critical part in the manufacturing industry. Industrial robots have replaced numerous menial tasks in the automation line that were done by humans before, making the processes more efficient and faster.

Advance in robotics has also led to revolutions in numerous industries including healthcare practices such as therapy, surgery, rehabilitation, etc. A good example of this would be the Da Vinci Surgical System, used all over the world which utilizes the hand movements of surgeons to control tiny instruments inside the patient's body, allowing for minimally invasive procedures to go off without a hitch. Another example could be robotic

devices such as exoskeletons that help people with rehabilitation after suffering strokes.¹

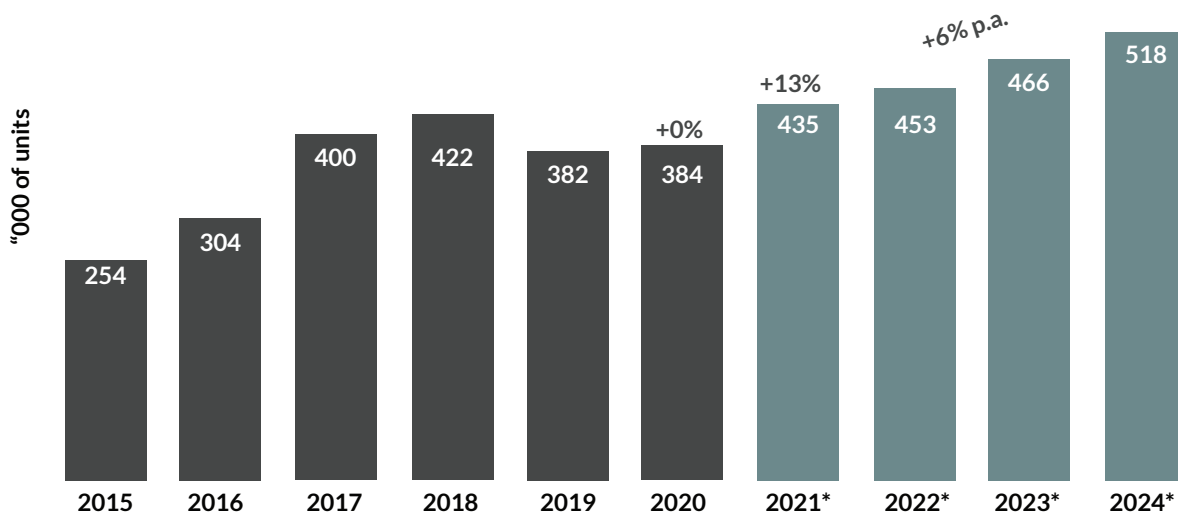
The agriculture industry has also reaped the benefits of robots through tractors and harvesters that have GPS installed in them, autonomous systems that take over tasks like pruning, spraying, and sensor technology that keeps away pests. The military too has been making ample use of this technology whether it is through unmanned drones that are being used for surveillance in combat zones or ones that deliver critical aid supplies in hard-to-reach areas.

So if you look at it, robots are everywhere. From robots that clean our houses to robots that construct our cars, this new wave of technology has made our lives infinitely easier.



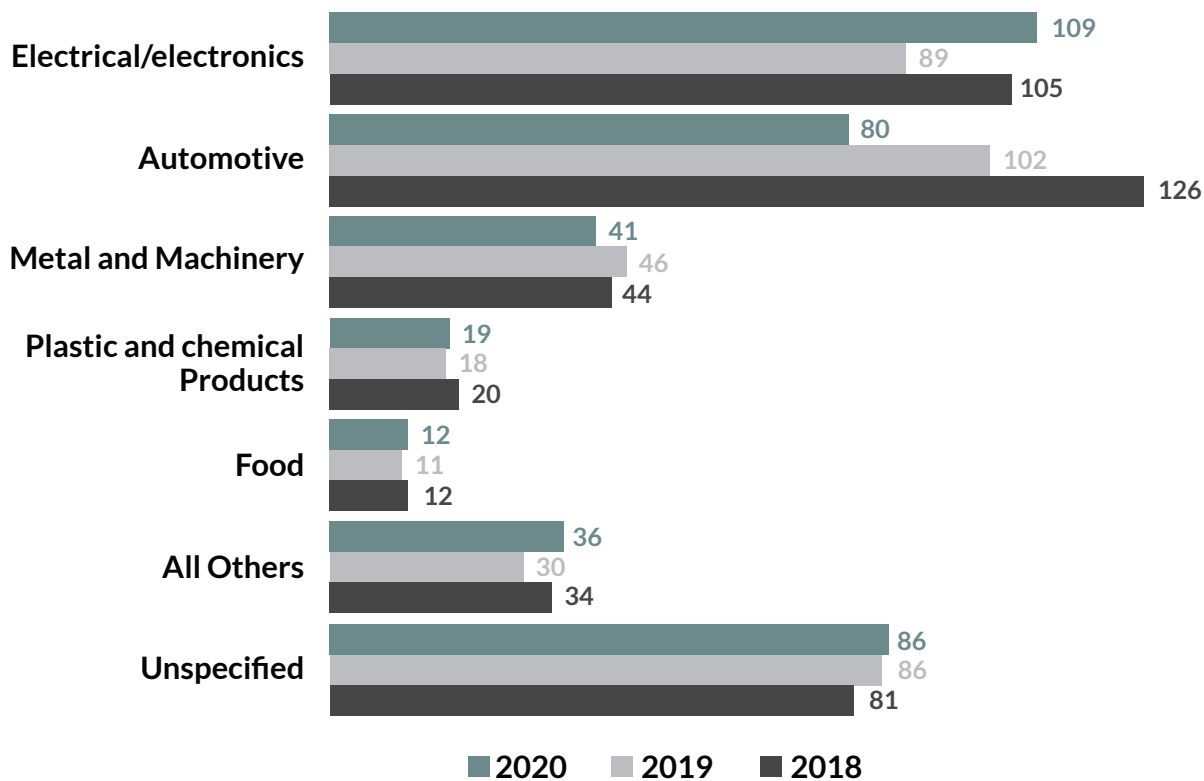
¹<https://onlinemasters.ohio.edu/blog/5-industries-utilizing-robotics/>

Annual Installations of Industrial Robots 2015-2020 and 2021*-2024*⁷



Source: World Robotics 2021

Annual Installations of Industrial Robots by Customer Industry world 1,000 Units⁸

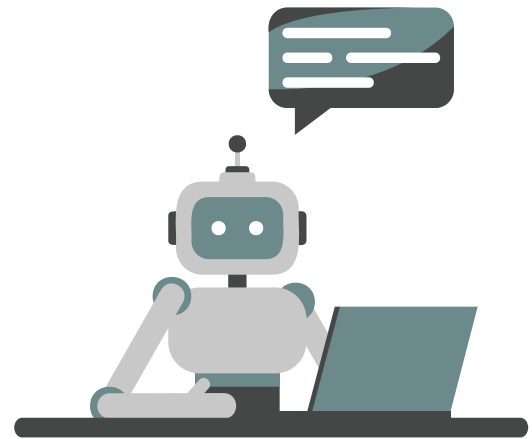


Source: World Robotics 2021

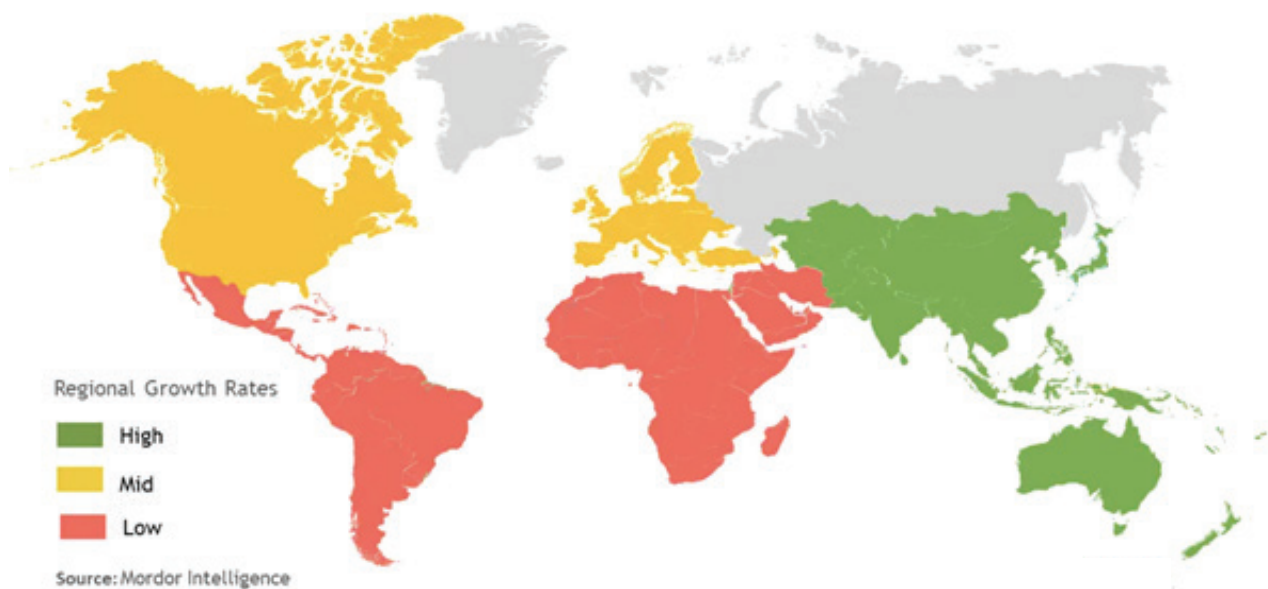
⁷<https://ifr.org/ifr-press-releases/news/robot-sales-rise-again>

⁸https://ifr.org/downloads/press2018/2021_10_28_WR_PK_Presentation_long_version.pdf

Asia Pacific is set to take the lead in the industrial robotics market which can be directly attributed to the growth in reliance on automation in places like China, India, and Japan. Growth in this sector can also be attributed to the rising population, which has increased the demand for consumer goods. Companies have had to increase their production capacity thus increasing the demand for industrial robots⁹. For the educational robot market, North America took the lead due to the presence of digital robot infrastructure in the market along with a stronger adoption rate for advanced technologies.¹⁰



Global Robotics Market - Growth Rate by Region (2021-2026)¹¹



Factors pushing for growth in the industry

The growth in the industrial demand for robots can be attributed to the increasing use of automation in the production of automobiles as well as the adoption of intelligent production systems in which robots play a crucial role. Industry 4.0 has also pushed robots to the forefront with

them playing an important role in the development and deployment of new technologies. Industrial robots are in demand in a variety of different sectors including automotive, consumer electronics, pharmaceuticals, manufacturing, and packaging.

⁹<https://www.prnewswire.com/news-releases/demand-for-global-industrial-robotics-market-size--share-is-expected-11-8-cagr-rise-will-hit-to-usd-81-4-billion-globally-by-2028-with-covid-19-analysis--industry-trends-value-analysis-forecast-report--z-on-market-resea-301549130.html>

¹⁰<https://www.globenewswire.com/news-release/2022/08/03/2491525/0/en/Educational-Robot-Market-Size-to-hit-3-32Bn-Globally-by-2028-with-20-2-of-CAGR-Exclusive-Report-by-The-Insight-Partners.html>

Education robots are used for their assistance in teaching disciplines such as science, technology, programming, etc. These robots can be integrated with more than 20 languages and help enhance content delivery. Another area in which these robots excel is as therapist aids for developing social skills in children with autism.

For the global consumer services robot market, the push came from the popularity of robot vacuums which have captured two-thirds of the consumer service robotics market. With advances in AI being pushed forward every single day and the prices of components coming down, robots are becoming more affordable.

The key players in the industrial robotics market include ABB, FANUC, YASKAWA, Mitsubishi Electric, Kawasaki Heavy

Industries, and Denso Corporation amongst others. Besides the industrial robotics industry, other giants in the sector include iRobot which not only builds robots for space exploration and military defense but also built the award-winning robot Roomba, GreyOrange which designs and manufactures advanced robotic systems for logistics and supply chain management, Epson Robots which has factory automation products and solutions, Rethink Robotics which creates collaborative robots and Alphabet Inc which deals in driverless cars.¹²

The increase in commercial air traffic has led to a boost in the aerospace robotics market space. These types of robots offer high precision and performance when it comes to the manufacturing of aerospace engines and any other precision work associated with aircraft.



¹²<https://www.analyticsinsight.net/top-10-robotics-companies-in-the-world/>

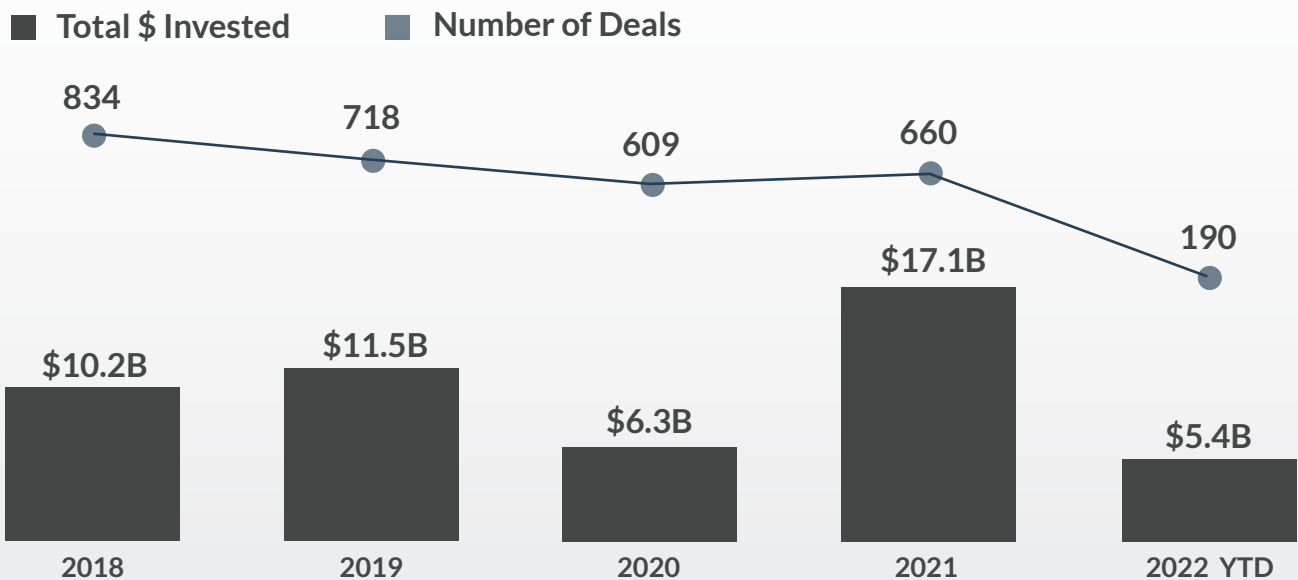
Robotics Startup Unicorns¹³

Name	Valuation	Country
ZongMu Technology	\$11.40 billion	China
Nuro	\$8.60 billion	United States
Argo AI	\$7.25 billion	United States
Horizon Robotics	\$5 billion	China
UBTech	\$4.45 billion	China

When it came to the startup space, 2021 saw more than \$17 billion being invested into robotic startups, nearly triple the amount of investment raised in 2020.¹⁴

Funding In Robotics¹⁵

Funding Number Includes Pre-Seed, Seed and all Venture Rounds.

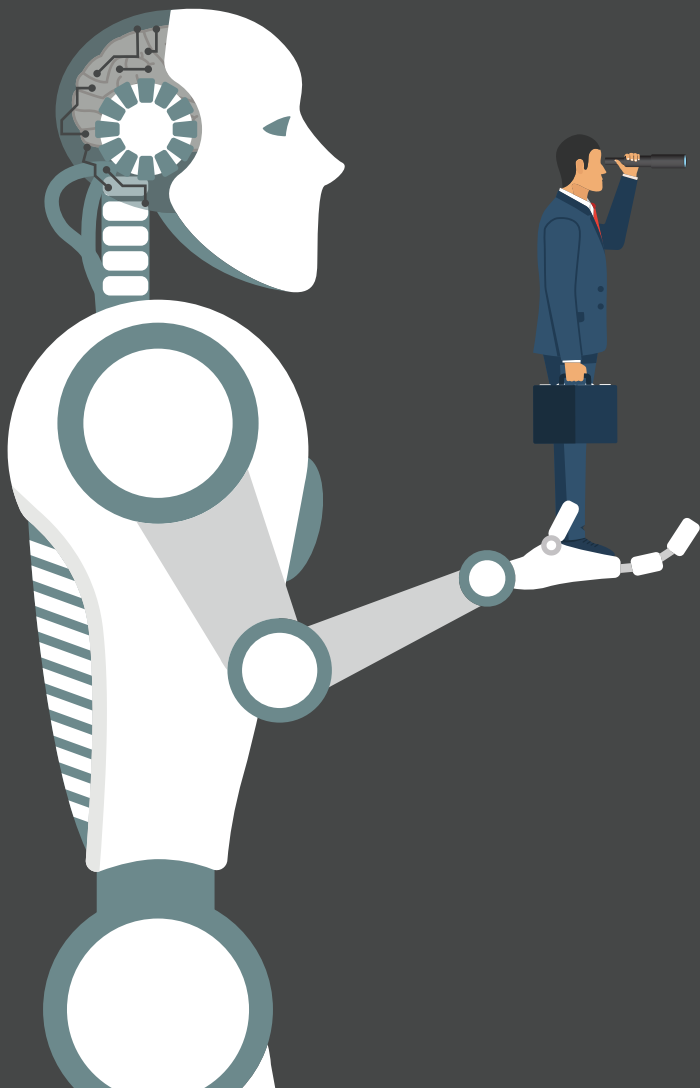


Source: Crunchbase News

¹³<https://www.failory.com/startups/robotics-unicorns>

¹⁴<https://news.crunchbase.com/ai-robotics/robotics-vc-funding/>

¹⁵<https://news.crunchbase.com/ai-robotics/robotics-vc-funding/>



Where do Robotics Stand in Pakistan?

Much like other developing technologies like blockchain, artificial intelligence, etc that have worked wonders for the rest of the world, Pakistan has taken an avid interest in boosting the presence of the robotics industry.

The epicenter of research in this area lies with the National Centre of Robotics and Automation which is a consortium of 11 labs situated in over 13 universities in Pakistan. Headquartered at the NUST College of E&ME, NCRA aims to use researchers, scientists, and experts to bring a Robotics revolution to Pakistan. To this effect, the NRCA holds a yearly Robotics Startup Challenge in partnership with UNICEF and Ignite Technology Fund centered around different themes.¹⁶

NUST's Department of Robotics and Artificial Intelligence was also the place where the first academic initiative was taken by Pakistan in this field. The department is mainly focused on postgraduate studies and research in the areas of Robotics, Mechatronics, Machine Intelligence, Control Systems, and Machine Vision.¹⁷ One of its graduates has been credited with introducing the first food-serving robot in Pakistan in 2017 before moving on to a complex humanoid robot through 3D printing.¹⁸

Academics are also trying to instill interest in robotics in students from a young age so they can grow up to choose STEM fields. One such company that is working towards this goal is Robokids which provides learners and educators with the opportunity to expedite learning in STEM-related fields¹⁹ while another called Edvon holds Pakistan's biggest coding and robotics competition.²⁰

An MOU was also signed between the Sindh Education Department and SZABIST (Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology) to teach Robotics

¹⁶<https://ncra.org.pk/>

¹⁷<https://smme.nust.edu.pk/departments/rime/>

¹⁸<https://www.arabnews.pk/node/1962126/pakistan>

¹⁹<https://www.robokids.pk/wp/>

²⁰<https://www.theedvolution.com/>

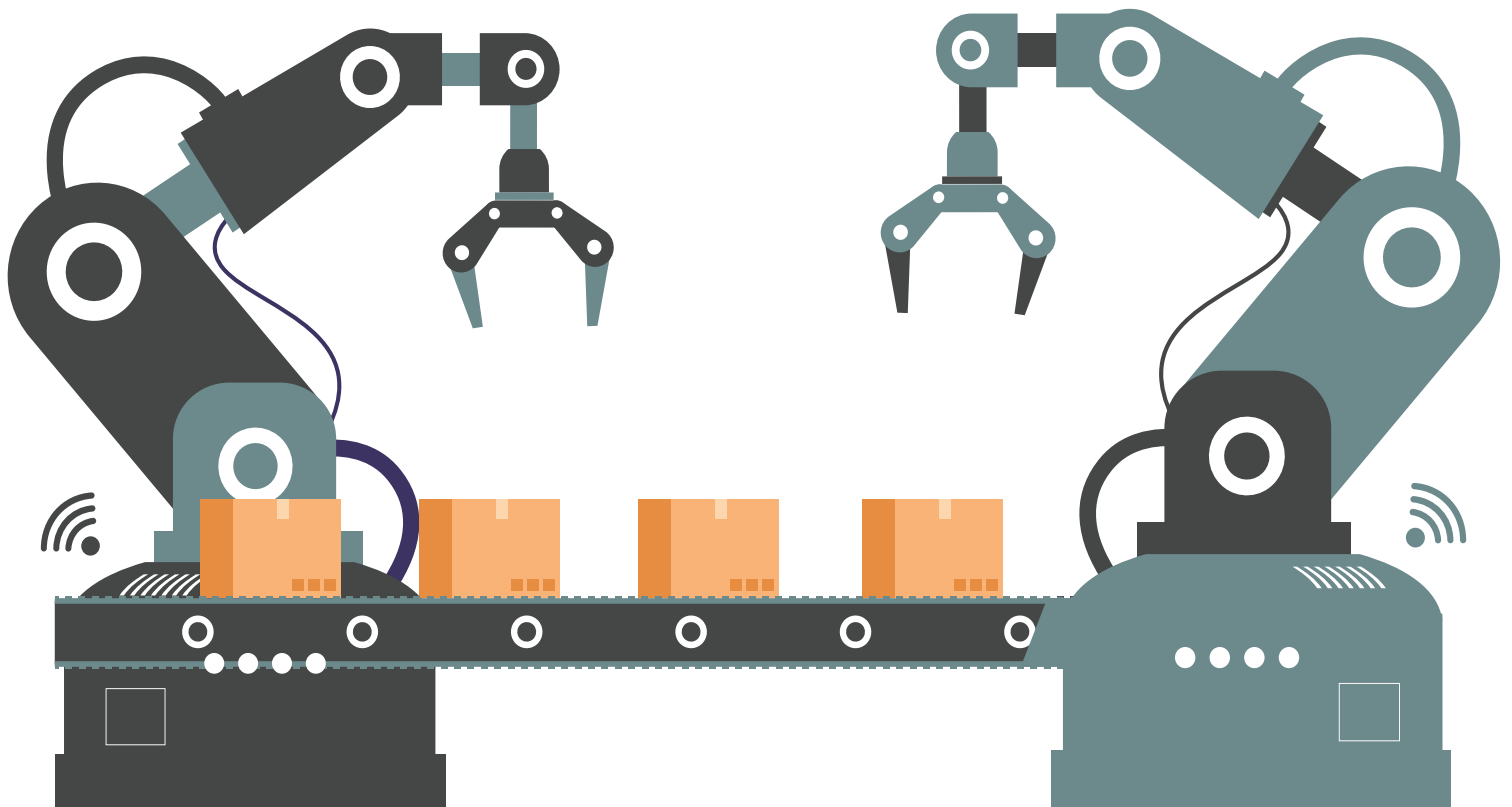
and Coding in government schools in the province.²¹

2019 saw Synthetic Products Enterprises Ltd becoming the first industrial group in Pakistan to install robots in its assembly lines. SPEL which is one of the leading manufacturers of plastic and packaging products onboarded this new system to increase work productivity.²²

While in 2022, National Health and Medical Centre Punjab carried out its first-ever robotic surgery. The hospital conducted 13 surgeries using robots which included five urology surgeries, four general surgeries and four gynecological surgeries. Five special operation theatres were built for this very purpose with an accumulated cost of Rs.250 million.²³ A robotic surgery and training center was also inaugurated at the Sindh Institute of Urology and Transplantation (SIUT) in March 2022.²⁴

Besides medical hardware robotic systems, robots have also been aiding doctors in other areas of healthcare. A student of the Usman Institute of Technology developed a robot in 2022 that can help children with autism improve their social skills and overcome loneliness. The robot named Peeku communicates in both English and Urdu and hopes to introduce the robot in the market for Rs.200,000.²⁵

Another great contribution of the robotics revolution to the world has been the different applications of drones. From aid delivery to surveillance, unmanned aerial vehicles have made many tasks easier. Pakistan too has been using UAVs in different sectors primarily agriculture. Drones are being used to provide, process, and analyze data of high spatial and temporal resolution for the management of crop production.



²¹<https://dailytimes.com.pk/917744/mou-signed-to-teach-robotics-coding-in-sindh-schools/>

²²<https://www.dawn.com/news/1458637>

²³<https://www.pakistantoday.com.pk/2022/06/04/nhmc-conducts-first-ever-robotic-surgeries/>

²⁴<https://tribune.com.pk/story/2343175/robotic-surgery-facility-inaugurated-at-siut>

²⁵<https://tribune.com.pk/story/2342778/locally-made-robot-in-karachi-takes-fight-to-autism>



Besides that, drones are being used by the media industry to cover events like political rallies and cricket matches while the police have been using them for surveillance mostly on highways. In this regard, the country’s first drone policy was also approved in 2020. A committee was also greenlit to formulate a legislative and regulatory body that would oversee the safe and legalized use of drones in different areas.

The same year, Islamabad police started using drones to track street crime suspects and Pakistan introduced locally developed drones manufactured by ABM SATUMA to fight locust attacks.²⁶ The Civil Drone Regulatory Authority was established in 2021 aimed at formulating policies and frameworks to formalize local manufacturing of drones and regulate their applications in the civil sector.

Training and Development	RoboticsClub, RoboKids, Edvon, Learnobots, RoboticsWorld, Stem Wizards Academia
Health, and Wellness	Bioniks, Arm Rehab
Industrial Solutions	Fusions Group, Silicon Nexus, ADBLED, Pakistan Chain Centre
Consumer Solutions	Aeyron, AppRocket, SensViz, DoWithAI, BluTech Consulting, FooMotion
Drones (commercial and personal)	UAS Global, QUMAQ, Integrated Dynamics, SATUMA

²⁶<https://gulfnews.com/world/asia/pakistan/pakistan-to-launch-drone-policy-to-boost-local-manufacturing-in-dustry-1.76066172>



Bioniks

Bioniks is a social enterprise that creates prosthetics. Their Artificial Limbs or Prosthetic limbs are the most advanced available in Pakistan. They aim to provide innovative solutions in the form of advanced prosthetic limbs. Their area of service includes the development of prostheses and models for surgical planning. The company recently set a world record by providing a bionic arm to a 4-year-old, breaking the previous record held by the UK-based company which provided a bionic arm to an 8-year-old.²⁷ The company also recently partnered up with PSO to provide free bionic arms to 26 deserving individuals.²⁸

Fusions Group

Fusions Group is a partnership commercial entity aimed at research and development in electronics, industrial automation, defense, robotics, alternate energy, integrated solution, biotechnology, agriculture, chemical, telecommunication, optical and security, and surveillance sectors. FG also provides sourcing services, customized engineering solutions, product development services, equipment, and systems on a commercial basis for telecommunication, defense, commercial and industrial sectors throughout the globe. FG is actively involved in the various R&D projects of Pakistan armed forces, as well as registered as a qualified bidder with Defence Acquisition Program Administration (DAPA) South Korea. FG is the first organization in Pakistan that has developed Pakistan's first successful VTOL (Vertical Takeoff and Landing) UAV named FLYING COP for city surveillance and traffic monitoring.²⁹

²⁷<https://bioniks.org>

²⁸https://fb.watch/eHVq099_1E/

²⁹<http://www.fusionsgroup.com/>

³⁰<http://www.armrehabtech.com/>

³¹<https://www.facebook.com/sskic.iobm/photos/a.105575325033821/335362048721813/>

³²<http://adbled.com/index.html>



Arm Rehab

Arm Rehab wants to convert disability into empowerment by using advanced robotic technology. They hope to do it by increasing the accessibility, durability, and functionality of prostheses with flexible payment options. They use a microcontroller to process electric activity generated by users thinking of a grasp and then convert that activity into the action of the limb. Their prosthetic arms are one of the lightest in the market and depending on the space available in the socket can have a battery capacity ranging from eight hours to a day. They were also the winners of the Startup Grant Challenge 2022 hosted by the Shahjehan S Karim Incubation Centre.³¹



ADBLEDD

Adbled Pvt Ltd is one of the very first industrial robotic manufacturing start-up companies in Pakistan that develops robotic arms, CNC machines, and their critical components as well as it provides industrial automation solution. Their two major projects due to be introduced in Pakistan's industrial market include a Robotic Arm which is mainly aimed to bring automation and increase the production capacity of industrial sectors and CNC machines for high-precision work in the automotive and manufacturing sectors.³²



Silicon Nexus

Silicon Nexus is an emerging global leader making strides in the area of the 4th industrial revolution. They provide end-to-end product development, IT consulting, and innovative technological solutions globally. Their domain expertise spans a wide tech spectrum of hardware design, embedded systems, web applications, integration of AI models, and enterprise mobility solutions to help businesses surpass in efficiency and performance.³³

FOOMOTION

FootMotion

FootMotion was founded in 2015 by our CEO Afraz Ali. They originally started as an off-shore team that handled all the engineering and design work of a US-based digital agency named Punch. They offer Departmentalized engineering services to cover all aspects of product development. Their Engineering, UI/UX, Project Management, Quality Assurance, and Account Management departments all work together seamlessly to produce a great experience and amazing results for our customers.³⁴

BluTech Consulting



Blutech Consulting was formed by a group of tech-savvy consultants who have vast experience globally in the field of Big Data and Analytics. They have served Fortune 500 companies and helped customers in various industries. Blutech was acquired by Jaffer Brothers. Their focus is on providing complete solutions and services to enterprises around the world. By integrating data regardless of size or structure, we identify recurring patterns, build metrics and implement integrated analytics systems that provide value, optimization, and cost advantages. Their clients include Bank Alfalah, Zong, Dubai Islamic Bank, State Bank of Pakistan, Absa, and Vodacom amongst others.³⁵



³³<https://silicon-nexus.com/>

³⁴<https://www.foomotion.io/>

³⁵<http://www.blutechconsulting.com/>

▶ UAS-G

UAS Global

UASG are pioneers in the Pakistan UAV Industry with the collective expertise of more than 40 years. They are a team of Unmanned Aerial System Specialists who consult and provide advanced Drones (UAV), Unmanned Aerial Systems and have essential experience in providing Aerial Monitoring, Industrial Inspections, Surveys, and Reports to International Standards in Pakistan. They also provide drone training programs for pilots.³⁶

QUMAQ

Qumaq is an on-demand custom drone solution. Whether you are a drone operator, seeking to expand logistic service, or setting up a new business, Qumaq provides easy and affordable drone platforms for multiple use cases in your business. To operate a fleet of drones automatically, safely, and cost-effectively, they have developed the most affordable copter drones that are controlled using their custom automated platform, rather than relying on a pilot. They are giving clients all the tools they need to start using their drones for drone deliveries, aerial pollination, surveillance and monitoring, mapping, and 3D modeling, and multiple other industries.³⁷

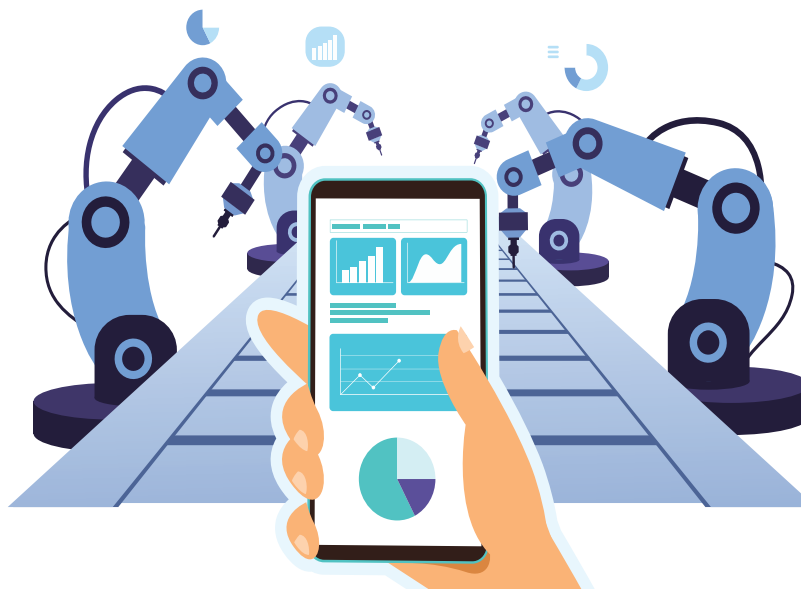


Integrated Dynamics

Integrated Dynamics provides design, consultancy, and turn-key project commissioning for Unmanned Autonomous Vehicle Systems (UAVS). They can assist you from the ground up in the rapid completion of your project from the conceptual stage to actual prototype flight tests in the shortest possible time.

They are a full supply source company for everything you need to get a UAVS project in the air - including Platforms, Flight control systems, C4I systems, Datalinks, Payloads, and Ground Control Stations (GCS). They also provide a full line of accessories such as Ground Support Equipment (GSE), APUs, Starters, Battery management systems, and Launch and Recovery systems.

Their new 'Civilian' UAV systems portfolio includes systems that are designed for emerging applications in the areas of law enforcement, border and coastal patrol, and scientific research.³⁸



³⁶<https://uas-global.com/>

³⁷<https://www.qumaq.com/>

³⁸<https://idaerospace.com/>



SATUMA

SATUMA prides itself on the development, design, and manufacture of UAVs (Unmanned Aerial Vehicles) for surveillance and other civilian applications. With over two decades of R&D and manufacturing experience, SATUMA is well poised to take advantage of the increasing global demand for unmanned surveillance systems. SATUMA also has the distinction of being the only company in the private sector whose products are formally inducted into the Pakistan Air Force and Army.³⁹



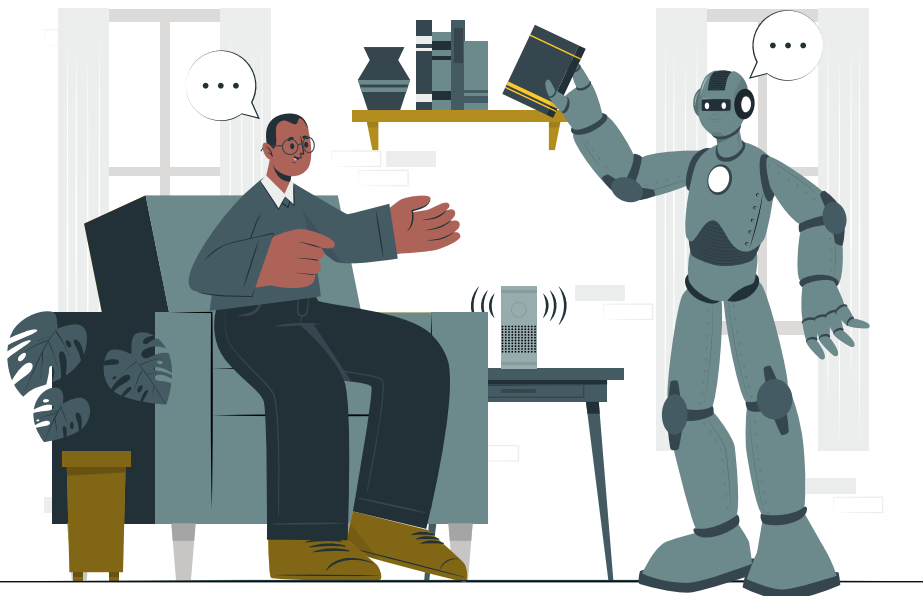
STEM Wizards Academia

Stem Wizards Academia has been providing continuing STEM Education for both schools and individuals in Canada and Pakistan. The purpose of their organization is to improve the world of the future and to promote individual wellbeing through enhanced learning, knowledge- sharing, and sustainable development. They hire Mechatronics Engineers, Electronics Engineers, Software Engineers, Computer Scientists, and Fine Arts Graduates to Utilize their knowledge and skills to teach Kids the latest Technologies.⁴¹



Pakistan Chain Centre

Pakistan Chain Centre specializes in providing the best solutions for power transmission and conveying the needs of all industrial units in Pakistan. They import from the world's most recognized and renowned manufacturers of Industrial chains and their components, with a proper quality check performed after importing them to ensure the reliability & durability of these chains. Some of their notable clients include Pepsi, Nestle, Coca-Cola, Unilever, Packages Limited, Gourmet Foods, Lucky Cement, etc.⁴⁰



³⁹<https://satuma.com.pk/>

⁴⁰<https://pakchain.com/>

⁴¹<https://www.stemwizardsacademia.com/>

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