100 ITALIAN ROBOTICS & AUTOMATION STORIES

2020
Last March, in the municipality of Peccioli in Tuscany, the first robotic shopping carts were taken into service. The carts go straight to the shops’ entrances and then reach autonomously the houses of the people who made the purchases. In May, at the Gran Caffè di Rapallo, which Hemingway was known to frequent, the first two robotic waiters in Liguria and Italy were officially put into service. While in Ravello, during the summer, a robot took turns with Maestro Massimiliano Carlini in conducting the Instrumental Ensemble of the historic Salerno State Conservatoire ‘Giuseppe Martucci’.

Robots and automatons become part of everyday life, more and more present in housework, recreation or care. Their presence is already a consolidated reality in many contexts, as in that of surgical robots that improve the quality of procedures, helping patients to recover more quickly. In Italy, robotic surgery is already used in thousands of procedures per year. The automatic carts for the transport of goods and food, active 24 hours a day, every day, in many hospitals, logistics centres and in industry, are a further proof.

Worldwide, the robot market has reached a value of 16.5 billion dollars; in 2018 alone, 422,000 robots were shipped worldwide, with a 6% increase compared to the previous year. The Italian industry ranks sixth in the world in terms of total stock of installed industrial robots (69,142 units in 2018)\(^1\), with China, Japan, South Korea, United States and Germany ahead. The 2015-2017 period has seen an increased use of robots, also due to the super-amortisation

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\(^{1}\) IFR, World Robotics 2019
incentives on the purchase of new machinery: +48% in food; +27% in fashion; +21% in wood-furniture; +23% in metalworking. In production, the Italian robotics supply chain counts 104,000 companies, which have grown by 10% in five years, employing a total of 429,000 people (+17% in five years). The first province is Milan with about 12,000 companies and 110,000 employees; then Rome with 11,000 companies and 63,000 employees; followed by Naples with 5,000 companies and 13,000 employees, and Turin with 5,000 companies and 25,000 employees. Brescia, Padua, Bari, Bologna, Florence, Monza and Brianza, Bergamo and Salerno follow with about 2,000 companies. There are realities such as that of the packaging valley, which boasts the highest concentration of manufacturers of packaging machines, with a total turnover of 7.6 billion euros in 2018 (1.5 billion of which from IMA – Industrie Macchine Automatiche – alone).

The 100 Innovation Stories Report, promoted by Enel and Symbola Foundation in cooperation with UCIMU Foundation, is now in its fourth edition, after having studied innovation in the renewable energy, circular economy and e-mobility supply chains, delves into robotics and automation, another sector of national excellence, deeply rooted in our country. Five hundred years ago the first project in history for a humanoid robot, designed by Leonardo Da Vinci, was completed. His mechanical knight, which we do not know as to whether it was ever made, must have been composed of a series of cogs that Leonardo pinned down on various pages, some of which were, and still are, to

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3 Data source: elaboration of the Milan Chamber of Commerce Monza Brianza Lodi
4 Data source: Ucima
5 Fonte dati elaborazione della Camera di Commercio di Milano Monza Brianza Lodi
understand. Leonardo’s mechanical knight could probably move its arms, looking like an armoured soldier. Later on, during the 18th century, other inventors worked on automats or self-propelled mechanisms. At the time, it was more about machines made to entertain and impress the observer; it had nothing to do with the robots that in the middle of last century began to populate the factories. Franco Sartorio, an Italian, was behind the birth of mechatronics. He was a pioneer of the combination of mechanics and electronics and in the 1960s he founded the Digital Electronic Automation (DEA) in Moncalieri (TO), where the Measuring Machine was produced; a device for dimensional measurements that “conquered” the world. Robots appeared in the Italian industry in the 1970s, when Fiat introduced Robogate to its plants: a robotic system for assembling car bodies, developed by the Turin-based COMAU, one of the most famous robotics companies in the world. SIRI, the Italian Robotics and Automation Association, the second association in the world in order of time (the first one was in Japan), was founded in Italy in 1975, twelve years before the foundation of the international federation.

The excellence of Italian scientific research in the field of robotics is recognised throughout the world, albeit too little in Italy. In 2015, Barbara Mazzolai and Cecilia Laschi, two of the world’s leading experts in robotics, were included in the ranking of “25 women in robotics you need to know about” by RoboHub, the largest international scientific community. Both of these women were inspired by nature in creating innovative robots. Barbara Mazzolai, director of the Center for Micro-BioRobotics of the Italian Institute of Technology (IIT) in Pontedera (PI), has created Plantoide, a robot that mimics the behavior of plants; Cecilia Laschi, Professor of Industrial Bioengineering at the Biorobotics Institute of BioRobotics of the Sant’Anna School of Advanced Studies, is also globally recognized for her work in bio-inspired robotics. She has been involved in the development of bio-inspired robots for industrial applications, such as the SoftHand, a robot hand designed to mimic the flexibility and dexterity of a human hand. Both of these women have been instrumental in advancing the field of robotics in Italy and around the world, and their work continues to inspire new generations of engineers and scientists.
is one of the pioneers of soft robotics, a branch of robotics dedicated to the development of machines with soft and deformable surfaces, which created the octopus robot that, with its dexterity, offers unprecedented possibilities of use. The European Commission recently chose the Pisa-based institute as the head of the first EU network of laboratories entirely dedicated to this field. Italian robotics reaches also the infinite space: several technologies made in Italy were installed on the NASA InSight robotic lander that touched down on Mars in 2018 and on those that in 2020 will be used in the ExoMars mission to study the Martian soil, such as the Larri (Laser Retro-Reflector for InSight) retroreflective semi-sphere which will provide the position of the lander on Mars’ surface, developed by the National Institute for Nuclear Physics (INFN) with the support of the Italian Space Agency (ASI).

However, robotics in Italy crosses the boundaries of research centres and businesses, becoming a culture and a widespread passion. Many institutes teach robotics, not only on a theoretical level, enabling young people to deal directly with programming of machines and to challenge each other through competitions specifically designed for them, in which schools from all over the peninsula participate. The interest in the field is so widespread among students that Italy is the only country in the world to have its own national Zero Robotics Championship. It is an international competition in aerospace robotics, which involves the programming and management of remote-controlled robotic mini-satellites, assembled by MIT and located on board the International Space Station. The competition, which is internationally promoted by NASA, ESA, MIT and other important aerospace research centres, is coordinated by Polytechnic University of Turin, ASI, University of Padua, Rete Robotica a Scuola and the Regional Scholastic Office of Piedmont. Not by chance, the 2018/2019 World Championship finals was won by two
Italian teams, the IIS Avogadro of Vercelli with its Liceo Scientifico and the Liceo Scientifico F. Cecioni of Livorno, ranked respectively first and second in alliance with U.S. teams.

Recently, the students of the Istituto di Istruzione Superiore Fortunio Liceti in Rapallo were awarded a prestigious second place at the First Global Challenge of Robotics in Dubai.

Italy has also proved to be ahead in the robotic design field, with the aim of improving the comfort of the interaction between robots and people, as in the case of the robotic hand - Hannes. The prosthesis was designed by Rehab Technologies IIT - Inail Lab of Genova in collaboration with designers Lorenzo De Bartolomeis, Gabriele Diamanti and Filippo Poli (ddp studio) and was awarded by the Association for Industrial Design with the National Prize for Innovation “ADI Design Index 2018”.

Moreover, the collaboration between the Higher Institute for Artistic Industries (ISIA) of Florence and the Sant’Anna School of Advanced Studies in Pisa was created to develop projects in that direction. Design and ergonomics also come into play in the creation of exoskeletons and other robotic devices that in the future will support human work by improving efficiency and reducing the risk of accidents and injuries, allowing workers to perform less risky activities being more focused on management or product customisation.

Robotics studies deal also with human and artificial intelligence and also in this field there is a strong commitment of our country, which has been at the forefront for many years. In 2014, Italy hosted the first international conference on robotics (a term coined in 1942 by the scientist and science fiction writer Isaac Asimov) about the implications of the interaction between algorithms, robots and humans, and to promote and encourage the development of robotics for the well-being of individuals and society.


Altro tema sul quale l’Italia si è dimostrata avanti è quello del design, con l’obiettivo di rendere più confortevole l’interazione tra robot ed esseri umani. Come nel caso della mano robotica Hannes: la protesi realizzata dal Rehab Technologies IIT – Inail Lab di Genova in collaborazione con i designer Lorenzo De Bartolomeis, Gabriele Diamanti e Filippo Poli (ddp studio) e premiata dall’Associazione per il Disegno Industriale con il Premio nazionale per l’innovazione “ADI Design Index 2018”. E la collaborazione tra l’Istituto Superiore per le Industrie Artistiche (ISIA) di Firenze e la Scuola Superiore Sant’Anna di Pisa è nata proprio per sviluppare progetti in questa direzione. Design ed ergonomia entrano in gioco anche nella creazione di esoscheletri e altri dispositivi robotici che nel futuro supporteranno il lavoro umano rendendolo più efficiente e diminuendo il rischio di incidenti e infortuni, consentendo agli operatori di svolgere attività meno rischiose e per lo più gestionali o legate alla personalizzazione dei prodotti.

In questo spazio di mezzo tra intelligenza umana e intelligenza artificiale si collocano gli studi di roboteca e anche qui si rileva un impegno del nostro Paese, da molti anni in prima linea. L’Italia infatti già nel 2014 ha ospitato il primo convegno internazionale di roboteca (termine coniato nel 1942 dallo scienziato e scrittore di fantascienza Isaac Asimov) sulle implicazioni dell’interazione tra algoritmi, robot e umani, oltre che per
at large. The researches also include the progressive reduction of low-skilled and arduous jobs in favor of an increase in high-skilled jobs, even if completely new and creative.

This is the country pictured by Enel and the Symbola Foundation in this fourth report on Made in Italy innovation, from domestic robots to space rovers, from the major centres of international excellence to the passion for robotics that runs through the young Italian generations from the south to the north of Italy. A narrative that without demanding completeness - despite the well-known limitations and problems - tells about technologies that improve the quality of lives of citizens in hospitals as well as at home, ease the tasks of workers in factories and increase safety standards. These are important innovations for many sectors, from automotive to agri-food and logistics. 100 experiences that once again prove that if Italy makes Italy, it is able to overcome any challenge thanks to its ability to combine functionality, design and well-being. This is the product of a culture that - even during periods of technologically advanced challenges - never forgets the paramount role of research, creating a people-oriented economy and society.

Francesco Starace | Ermete Realacci
When it comes to emergencies, saving time is essential to saving lives. A drone can help. What if we transported blood with a drone? Andrea Cannas and Giuseppe Tortora started from this very question, asked almost with little thought and ended up developing a brilliant and beneficial idea. As a spin-off of the Sant’Anna School of Advanced Studies in Pisa, they founded a startup incubated at the Polo Tecnologico Navacchio (PI) developing a drone capable of independently transporting blood, blood products, medicines and equipment from one health care facility to another, with no time and weather limits, working even in wind or rain.

It covers distances of up to 40 km and allows a time saving of up to 80% over short distances, more than 50% for longer journeys. It doesn’t need to be piloted because an app controls it: take-off, flight and landing are automated. The core of this flying robot is the smart capsule, designed to be resistant and durable, but also interchangeable, and especially to monitor the content in all stages of transport. The drone can carry up to 10 kg and is equipped with a parachute in the event of failure. In 2019 the first experimental transports were launched but in the future ABzero can also intervene in emergencies in difficult or dangerous areas.
Some build robots, and some incorporate them. The specificity of the machines doesn’t lie in their structure but in what they can do with the tools they have. Knowing how to interpret the needs of the company and develop ad hoc products is what Alumotion has been doing for twenty years, working to create robotic systems that are particularly useful for moving objects.

Youring is the device designed by the company from Cernusco Sul Naviglio (MI) to increase the safety of collaborative robots, those designed to work alongside man.

Youring is integrated into the robot and is equipped with a programmable ring light via an app that turns on, off and emits specific sounds to pass information. For example, if the left part of the ring is turned on, it means that the robot is moving in that direction; if the LED is intermittent, it invites the user to change the arm settings. The Freedrive button allows the user to set particular colours that correspond to specific behaviours, while YouTeach function saves workpoints by moving the robot directly; this way the machine is “taught” the path that will have to be replicated immediately afterwards, by merely pressing a button at each workpoint.

C’è chi costruisce robot, e chi li integra. La specificità delle macchine infatti non sta nella loro struttura ma in quello che possono fare attraverso gli strumenti di cui sono dotate. Saper interpretare le esigenze dell’impresa e sviluppare prodotti ad hoc è quello che Alumotion fa da venti anni, lavorando per realizzare sistemi robotici utili in particolare a movimentare oggetti. Youring è il dispositivo progettato dall’azienda di Cernusco sul Naviglio (MI) per aumentare la sicurezza dei robot collaborativi, quelli pensati per lavorare al fianco dell’uomo.

Come suggerisce il suo nome, Youring si integra nel robot ed è dotato di un anello luminoso programmabile via app che accendendosi, spegandosi ed emettendo determinati suoni comunica informazioni all’operatore che lo utilizza. Ad esempio, se si illumina la parte sinistra dell’anello, vuol dire che il robot si sta muovendo in quella direzione; se il led è intermittente, ci invita a cambiare le impostazioni del braccio per un’azione ottimale. Con il tasto Freedrive, l’operatore può impostare particolari colori che corrispondono a comportamenti specifici, mentre con la funzione YouTeach si possono salvare punti di lavoro direttamente muovendo il robot: in questo modo si “insegna” alla macchina il percorso che subito dopo dovrà replicare, semplicemente premendo un pulsante ad ogni punto toccato.
Just as the Argonauts, they are young and adventurous, but their ships sail through Space. They are the engineers of Argotec, a Turin-based SME that has conquered the aerospace sector thanks to the innovative skills of its 50 employees at an average age of 30 years. Founded in 2008, the company has obtained from ASI the coordination of all the Italian experiments carried out on the International Space Station. After building the Space Food Lab for food studies and even bringing espresso coffee to astronauts, Argotech announced its participation in LICIACube, a project for the development of a small satellite that will document the impact of an American spacecraft on the asteroid Didymos.

In 2018 the company collaborated with COMAU in the development of a new system for testing the functionality of nanosatellites. Usually, the tests are carried out through simulations and numerical analyses difficult to read. Argotec has created ATENA (Advanced Testing Emulator for Nanosatellite Arm), a system that allows getting a visual representation of the behaviour of the satellite through a robotic arm. The satellite is hooked to the robotic arm that simulates its movements by measuring mechanical responses and communication performances of the components. The result is a very realistic image of the satellite's behaviour in orbit, as well as the possibility of evaluating even complex situations such as the tethering of multiple satellites.
“Per aspera ad astra” is the expression used to denote that the desired destination can only be reached by overcoming obstacles and difficulties. PERASPERA is also the name of the project that since 2014 ASI - the Italian Space Agency - has been carrying out in collaboration with the European Space Agency and other partners. ASI, founded in 1988, based in Rome, is a public body supervised by MIUR, a world leader in space science and technology, particularly aimed at exploring the universe, monitoring the Earth from space and the construction and research activities of the International Space Station.

The project, launched in 2014 as part of Horizon 2020, aims to draw up a roadmap for the activities of the Research Cluster for the development of robotic technologies to be used in future space missions, to create autonomous systems able to intervene in the construction and maintenance of satellites and bases on other planets. From sensors to algorithms, the goal is to develop existing technologies and to develop new ones through periodic tenders addressed to companies and research centres. One of the issues in the works is the maintenance of satellites to extend their life and delay their removal: robotic devices could in the future intervene on satellites to repair or remove them from orbit after use.

Il progetto, avviato nel 2014 nell’ambito di Horizon 2020, ha l’obiettivo di tracciare una tabella di marcia per l’attività del Cluster di Ricerca mirato allo sviluppo di tecnologie robotiche da impiegarsi nelle future missioni spaziali, per realizzare sistemi autonomi in grado di intervenire nella costruzione e manutenzione di satelliti e di basi su altri planeti. Dai sensori agli algoritmi si cerca – mediante bandi periodici rivolti a imprese e centri di ricerca – di sviluppare tecnologie esistenti e di metterne a punto di nuove. Un tema su cui si lavora è la manutenzione dei satelliti per allungarne la vita e ritardarne la rimozione: i dispositivi robotici potrebbero in futuro intervenire sui satelliti per ripararli o rimuoverli dall’orbita a fine utilizzo.
We call them drones, but we should more correctly call them remotely piloted aircraft (RPA). They have now become everyday items, but their potential can be further implemented, especially when it comes to emergencies. Andrea Sala has always been a fan of flight systems. With a degree in mechanical engineering in his pocket, he founded Aslatech in Bologna, turning his passion into a job; to conceive and implement RPA.

In 2017 the European project SHERPA was concluded, in which Aslatech participated under the coordination of the University of Bologna. The aim was to create a system of sky and ground drones capable of quickly locating people buried under the snow to support rescuers in their recovery. The system consists of three robotic elements that contribute to the research: patrolling hawks, small drones flying over the avalanche area, intelligent donkeys, land transport rovers and trained wasps, drones that photograph the area and capture the signals from the instruments that the climbers wear. Aslatech has created the quadcopter drone Sherpa, the protagonist of the experiment, which today is renewed with AirBorne, an international project to improve the previous prototype, make it industrially viable and effectively use this technology in mountain rescue.

Comunemente li chiamiamo droni, ma più correttamente dovremmo definirli aeromobili a pilotaggio remoto (APR). Ormai sono diventati oggetti comuni ma le loro potenzialità possono essere ancora implementate, in particolare quando si parla di emergenze. Andrea Sala da sempre è un appassionato di sistemi di volo. Con una laurea in ingegneria meccanica in tasca, ha fondato a Bologna Aslatech trasformando la sua passione in un lavoro: concepire e realizzare APR.

Nel 2017 si è concluso il progetto europeo SHERPA a cui Aslatech ha partecipato sotto il coordinamento dell’Università di Bologna. Obiettivo era realizzare un sistema di droni da cielo e da terra in grado di localizzare in breve tempo persone sepolte sotto la neve per supportare i soccorritori nel loro recupero. Il sistema si compone di tre elementi robotici che concorrono nella ricerca: patrolling hawks, piccoli droni che sorvolano l’area della valanga, intelligent donkeys, rover terrestri da trasporto e trained wasps, droni che fotografano la zona e registrano i segnali provenienti dagli strumenti che gli scalatori portano addosso. Aslatech ha realizzato il drone quadricottero Sherpa protagonista della sperimentazione, che oggi si rinnova con AirBorne, progetto internazionale per migliorare il precedente prototipo, renderlo industrializzabile ed utilizzare effettivamente questa tecnologia nel soccorso alpino.
We are witnessing the shift to industry 4.0, but someone is already thinking about the next step. Since 2002 AutomationWare has been designing and manufacturing actuators, components that transform energy into the physical movement of the machine. Based in Martellago (VE) and with a very young staff, in 2019 the company has opened a new production plant in Maerne (VE) and has started a program for the construction of a modular robotic platform to build cobots tailored to the application for which they are used.

Not all cobots are required to handle heavy weights or move bulky objects. For this reason, AutomationWare has decided to create joints of different sizes and performances that can be combined to build “tailor-made” cobots. Precise and fast, these joints have a very advanced technology that also uses STMicroelectronics components. Thanks to the presence of microprocessors equipped with analogue and digital inputs, each joint can be connected to various external devices and host sensors and software that allow the cobot to respond logically to stimuli, avoiding the need to switch to an external computer, increasing efficiency and safety. The company collaborates with the Fraunhofer Institute of Bolzano for the realization of collaborative robotics in robot Operating Systems and the development of Machine Learning technologies.
Adam’s hand outstretched towards God’s in the Sistine Chapel vault is one of the strongest images produced by human creativity. ADAM’S Hand (A Dialogic, Adaptive, Modular, Sensitive Hand) is also born from creativity and competence. It is a prosthetic hand made in Lecce by 13 young people who have passionately embraced the idea of Giovanni Zappatore, a mechanical engineer with the dream of making his thesis come true.

A grant from the Puglia Region allowed them to create BionIT Labs and ADAM’S Hand, a myoelectric prosthesis that uses the impulses of the residual muscles of the arm to open and close the fingers, moved by a single motor. The sensors in the prosthesis detect the muscle contraction and an algorithm decodes it to transform it into movement, “learning” the characteristics of the user. The fingers adapt to the shape of the object they grasp and are printed in 3D. This makes them lightweight, robust and customized, while also reducing costs. While the European Patent Office welcomes the international patent application and the company completes a crowdfunding campaign, the team - winner of several awards including the Seal of Excellence of the European Commission - thinks about the future development of the prototype, with the integration to the prosthesis of a connection that allows technicians to intervene on the device even by remote.
BM Group was founded in 1993, in Trentino, with the provision of electrical and automation systems in the local area. The joining of ILVA Taranto marks the beginning of a process of specialization in innovative solutions for the steel industry. BM Group is now one of the protagonists of the 4.0 industry thanks to a consolidated turnover of over € 40 million, 150 employees, offices in Borgo Chiese (TN), Verona, Brescia, Taranto (within ARCELOR MITTAL ITALIA) and a company in the United States. Polytec, the world’s leading brand in steel robotics, has 200 robotic cells installed worldwide. Polytec robotics also supplies the aluminium, automotive, paper and pharmaceutical industries.

BM Group carried out an outstanding research project under the coordination of the TeCIP Institute of the Sant’Anna School of Advanced Studies in Pisa, “ROBOHARSH”. It is a workstation built to support the maintenance of the components of the ladle, the large container where molten metal is collected and transferred to other processing phases. The perfect cleanliness of the ladle avoids the incandescent material to leak but requires uncomfortable work. The robot takes care of lifting the heavy components, cleaning the inside with an oxygen lance and checking their condition with an artificial vision system. The operator controls everything from a safe workstation.

Un progetto di ricerca di rilievo che BM Group Polytec ha seguito, con il coordinamento dell’Istituto TeCIP della Scuola Superiore Sant’Anna di Pisa, è stato “ROBOHARSH”, una workstation realizzata per supportare la manutenzione dei componenti della siviera, il grande contenitore dove viene raccolto il metallo fuso per essere trasferito ad altre fasi di lavorazione. La perfetta pulizia della siviera permette di evitare fuoriuscite di materiale incandescente ma richiede un lavoro non confortevole. Il robot si occupa di sollevare le parti pesanti, pulire l’interno con una lancia ad ossigeno e verificare lo stato con un sistema di visione artificiale. L’operatore gestisce tutto da una postazione sicura.
To put man at the very centre of the 4.0 revolution is a necessity that is also satisfied through attention to ergonomics, human-machine interaction and psychophysical well-being. BNP deals with ergonomics, designing and manufacturing components and accessories for industrial workstations that adapt to the workers’ needs. Automotive, white goods and electronics industries turn to this small company in Cittadella (PD) to improve their production in terms of traceability, time, quality and health of the worker.

An example of a product is ZeroG, a zero-gravity arm that allows the screwing and handling of heavy tools without any effort for the user. In 2017 the company won the Innovation Award at MECSPE in Parma (Innovation Fair for the manufacturing industry) with a team of robots created for Anodica Trevigiana, a manufacturer of household appliance components. The workstation is managed by the Smart Manufacturing Manager (SMM) software, developed with Sogea Srl, which controls a collaborative robot for repetitive actions while the user handles the final control. The workstations can be adapted to different processes and are run centrally by a “manager” who, thanks to a control panel, can activate various functions based on the components and tools with which they are equipped.
Bonfiglioli has been working in the field of motors for over 50 years, producing gear motors, planetary gearboxes, drive systems and inverters for industrial automation, mobile machinery and renewable energy. Today the company is led by Sonia Bonfiglioli, winner of the 2018 Entrepreneur of the Year Award. Bonfiglioli has, in addition to its headquarters in Calderara di Reno (BO), 14 plants worldwide, 22 branches and a staff of 3,700.

The company has developed a Power Drive System that combines a synchronous motor with magnetic reluctance and an electric drive that, thanks to mathematical characterisations, is able to optimise the work points according to the specific application, reducing energy consumption to levels that other non-integrated solutions cannot reach, while maintaining a stable power supply at very low-speed regimes. All this with the possibility of integrating smart sensors which, by connecting to the IoT platforms provided by Bonfiglioli, create the opportunity of monitoring product and application data to optimise the product life cycle and therefore the machinery to which they are applied. In addition, Bonfiglioli introduced its Digital Re-training at SPS Parma 2019; a training program for operators to provide them with the skills they need to work in the plant 4.0.
It smiles, expresses fear, surprise, anger, disgust and sadness. It is called “Face” and is a robot unveiled in Pisa in 2017. When looking at its interlocutor, Face can understand the mood and respond through facial language. Thirty-two micromotors placed between the epidermis and the underlying structure allow it to control the movements, thus easily making contact with man. Face is one of the many results achieved in the Centro Piaggio, a research centre of the University of Pisa, founded in 1965 and active in particular in bioengineering and robotics. The certification standards used for the safety of robots were born from the PHRIENDS project coordinated by the Centre in 2004.

Among the ongoing projects, the robotic hand Pisa/IIT SoftHand that with a single motor moves the “tendons” of the fingers adapting to the object that grabs and connecting to the muscles of the limb through electrodes. Together with various international institutes, the Centre works to restore the tactile sensation to the amputee patient. AlterEgo, instead, is a semi-anthropomorphic robot designed to assist people from a distance and inspect dangerous areas such as earthquake zones. The Centre also has plans to automate warehouse logistics to create robots that work alongside humans, to improve their working conditions and increase productivity.


Tra i progetti in corso, la mano robotica Pisa/IIT SoftHand che con un solo motore muove i “tendini” delle dita adattandosi all’oggetto che afferra e collegandosi ai muscoli dell’arto attraverso elettrodi. Insieme a vari istituti internazionali, il Centro lavora per aiutare i pazienti amputati anche la sensazione tattile. AlterEgo è invece il robot semi-antropomorfo pensato per assistere persone a distanza e ispezionare aree pericolose come le zone terremotate. Il Centro ha anche progetti per l’automazione della logistica.
CMA ROBOTICS was founded in 1994 in Pavia di Udine (UD) and today ranks among the top ten most technological companies in the world in the industrial painting sector. The company projects, manufactures and installs a wide range of robots and painting systems providing complete solutions from design to incorporation. In addition to the single anthropomorphic robot or painting system, CMA can manage together with the customer the phase of integration of the painting system in the plant of destination. It guarantees cutting-edge technology: human intelligence and automatic execution. Thanks to direct self-learning programming (self-teaching), the control computer records the operator’s movements and repeats them at the desired speed.

Based on the proposed solution, CMA provides point-to-point, off-line and auto-generation programming using sophisticated machine vision systems. In 2018 in Milan, the company presented the new small GR680 robot for painting in the automotive sector. Among its customers, there is also FCA. Moreover, in collaboration with universities and research centres (Trieste, Udine, Pittsburgh, Wuhu) the company studies systems that allow the robot to recognize the shape and characteristics of the object to paint to decide how to perform the operations independently.

In base alla soluzione proposta CMA prevede programmazione punto a punto, offline e auto-generazione dei programmi per mezzo di sofisticati sistemi di visione artificiale. Nel 2018 a Milano l’azienda ha presentato il nuovo robot GR680 di piccole dimensioni per la verniciatura nel settore automotive. Tra i suoi clienti c’è anche FCA e in collaborazione con Università e centri di ricerca (Trieste, Udine, Pittsburgh, Wuhu) sta studiando sistemi che consentano al robot di riconoscere la forma e le caratteristiche dell’oggetto da verniciare così da decidere autonomamente in che modo svolgere le operazioni.
Big eyes and a gentle expression: that’s enough for people to fearlessly approach Pepper, a commercial robot, which CNR-ICAR (Istituto di Calcolo e Reti ad Alte Prestazioni) uses to develop research on cognitive robotics. Its artificial intelligence is, of course, the work of researchers at the institute based in Rende (CS), Naples and Palermo. CNR-ICAR deals with Knowledge Engineering and therefore also with robotic systems and their interaction with man. The researchers study methodologies to make the man - robot interactions more “natural” and to make robots able to perceive the world around them.

The thousands of pieces of information that the robot’s sensors receive every second from the environment are analysed and processed into sensations (which they call “roboceptions”) to obtain a sort of artificial somatosensory system. This system allows robots to have a perception of themselves and their relationship with reality. It is not enough to understand human language to establish a connection; other factors such as emotions and the ability to interpret them must come into play. CNR-ICAR uses Pepper to test these studies and verify their effectiveness through applications involving common users, especially children, who are very empathetic towards the young humanoid.

Grandi occhi e un’espressione simpatica: tanto basta perché le persone si avvicinino senza timore a Pepper, un robot commerciale, che il CNR-ICAR (Istituto di Calcolo e Reti ad Alte Prestazioni) utilizza per sviluppare la ricerca sulla robotica cognitiva. La sua intelligenza, artificiale naturalmente, è opera dei ricercatori dell’Istituto che ha sede a Rende (CS), Napoli e Palermo. Il CNR-ICAR si occupa di Ingegneria della Conoscenza e quindi anche di sistemi robotici e della loro interazione con l’uomo. I ricercatori studiano metodologie per rendere più “naturali” le interazioni uomo-robot e per rendere i robot in grado di percepire il mondo che li circonda.

Le migliaia di informazioni che i sensori del robot ricevono ogni secondo dall’ambiente sono analizzate e trasformate in sensazioni (che loro chiamano “robocezioni”) così da ottenere una sorta di sistema somatosensory artificiale. Questo sistema consente ai robot di avere una certa percezione di sé e del rapporto con la realtà. Per instaurare una relazione infatti non basta comprendere il linguaggio umano: occorre che entrino in gioco altri fattori come le emozioni e la capacità di interpretarle. Il CNR-ICAR utilizza Pepper per testare questi studi e verificarne l’efficacia con applicazioni che coinvolgono utenti comuni, in particolare bambini, che sono particolarmente empatici nei confronti del piccolo umanoide.
Russia, 1970’s. Fiat engineers are called upon by the Soviet authorities to build a state-of-the-art car factory. Their success is so striking that they found COMAU, COnsorzio MaCchine Utensili in Grugliasco (TO). COMAU is now a giant in industrial automation with 32 offices worldwide, 5 innovation centres and 9,000 employees. Leadership built on skills and the ability to meet the ever-changing needs of industry, such as digital technologies, electric vehicle manufacturing and human-machine collaboration, which the company calls HUMANufacturing.

This is where the AURA industrial cobot was born, capable of collaborating with man thanks to a series of sensors and safety systems. In 2018, to support operators working in repetitive activities, the company introduced MATE a wearable and lightweight exoskeleton. It is commercialised by COMAU (and produced in collaboration with IUVO S.r.l., a spin-off of the Institute of Biorobotics of Sant’Anna High School of Advanced Studies in Pisa, and the Icelandic company ÖSSUR), and relieves fatigue by supporting the torso and the upper limbs in their movements, improving the quality of work. e.DO, a small modular six-axis robot with open mechanical and electronic control, is designed to support teaching.

Russia, anni ‘70: alcuni ingegneri della Fiat vengono chiamati dalle autorità sovietiche a realizzare una fabbrica di automobili all’avanguardia. Il loro successo è così eclatante da indurli a fondare a Grugliasco (TO) il COnsorzio MaCchine Utensili, COMAU, oggi colosso dell’automazione industriale con 32 sedi in tutto il mondo, 5 centri di innovazione e 9.000 dipendenti. Una leadership costruita sulle competenze e sulla capacità di far fronte alle esigenze sempre nuove dell’industria, come le tecnologie digitali, quelle per la produzione dei veicoli elettrici e la collaborazione uomo-macchina, che in azienda chiamano HUMANufacturing.

Da qui nasce il cobot industriale AURA, capace di collaborare con l’uomo grazie a una serie di sensori e sistemi di sicurezza. Per supportare gli operatori impegnati in attività ripetitive, nel 2018 l’azienda ha presentato MATE, esoscheletro indossabile e leggero, commercializzato da COMAU (e realizzato in collaborazione con IUVO S.r.l., spin-off dell’Istituto di Biorobotica della Scuola Superiore Sant’Anna di Pisa, e l’azienda islandese ÖSSUR), in grado di attenuare la fatica sostenendo busto e arti superiori nei loro movimenti, migliorando la qualità del lavoro. e.DO, piccolo robot modulare a 6 assi dotato di un controllo meccanico ed elettronico aperto, è pensato per essere di supporto alla didattica.
MoVer-1 is the modular robotic platform created by Co-Robotics, a spin-off of the Sant’Anna School of Advanced Studies in Pisa, to perform both the tasks of logistics in an industrial environment and man-machine interaction for social robotics applications. The platform consists of a low-cost industrial mobile base, which largely uses recycled/recyclable material. The modular base, in addition to transporting objects, allows the installation of a bust and a robotic head to improve human-machine interaction in all those situations in which users are required to control the robotic platform intuitively.

MoVer-1 robot’s design has been possible thanks to the experience of the partners of the company, who since 2011 have participated in several research projects funded by the European Community and the Tuscany Region. The know-how behind the MoVer-1 robot dates back to the Robot-Era project, in which three robots cooperated with networks of sensors to provide assistance and advanced services to elderly people, both self-sufficient and not in their own homes. Besides, Handy is not a humanoid robot, but a biometric ring that monitors the gestures of the hand and the health of the wearer through miniaturized sensors.

Si chiama MoVer-1, la piattaforma robotica modulare creata da Co-Robotics, spin-off della Scuola Superiore Sant’Anna di Pisa, per assolvere contemporaneamente ai compiti di logistica in ambiente industriale, e di interazione uomo-macchina per applicazioni di social robotics. La piattaforma infatti è costituita da una base mobile industriale a basso costo, che utilizza largamente materiale riciclato/riciclabile. La base modulare, oltre al trasporto di oggetti, permette l’installazione di un busto ed una testa robotica per migliorare l’interazione uomo-macchina in tutte quelle situazioni in cui è richiesto agli utenti di gestire in maniera intuitiva la piattaforma robotica.

La progettazione del robot MoVer-1 è stata possibile grazie all’esperienza dei soci dell’azienda, che dal 2011 hanno partecipato a diversi progetti di ricerca finanziati dalla Comunità Europea e dalla regione Toscana. Il know-how dietro al robot MoVer-1 infatti risale al progetto Robot-Era, in cui tre robot cooperavano fra loro con reti di sensori per fornire assistenza e servizi avanzati ad anziani autosufficienti e non nelle proprie abitazioni. A questo si aggiunge Handy: non un robot umanoide, ma un anello biometrico che monitora i gesti della mano e lo stato di salute di chi lo indossa tramite sensori miniaturizzati.
“Reality is made of little things, Cosberg assembles them”: a perfect introduction for the company from Terno d’Isola (BG) founded in 1983 by Gianluigi Viscardi and his brothers Antonino and Ermanno. Cosberg studies, designs and manufactures modules and machinery for the automation of the assembly of products for various sectors: from automotive to watchmaking, from accessories for furniture, to electromechanical industry. The company, an international point of reference, has three branches (in France, Slovenia and Brazil) and five affiliates, among which Automac (automotive sector) and Cosvic (electromechanical sector) stand out. The Group has a turnover of about € 22 million and exports equal to 70% of production. Here the 4.0 revolution began before this term was coined, and today people are the real value, driven to innovation by the company philosophy.

Every year the Group devotes more than 10% of its turnover to R&D to satisfy a market that requires more and more customization. The systems of the Cosberg ecosystem, tailor-made for each customer, are unique compositions of the best technologies available and their performance can be continuously monitored through a system that allows knowing in real-time and from remote the productivity of the machines. Cosberg offers this Know-How to young people through projects aimed at the academic world.
In the 90s, it was founded under the name of CM Engineering, but perhaps it is best remembered as Telerobot Labs. Its history is entirely linked to automation and in 2016 the Danieli Group of Buttrio (UD), a steel plant manufacturer, acquired it. Danieli Telerobot Labs has always been involved in robotics, from more specific applications for heavy industry (such as inspection of melting furnaces, pipe maintenance) to remote-controlled devices for monitoring contaminated areas, be it asbestos or high radioactivity. The company owns the robot used in the "cleaning" - technically scarifying - of the chimney in the Garigliano (FR) nuclear power plant undergoing dismantling, as well as some parts of the iCub child robot.

With the IIT, it has established a long-term collaboration that is not limited to simple supplies but leads to a continuous exchange of knowledge. The Genoa-based company finds solutions for steep or inaccessible contexts, but its commitment also reaches people. In 2018 it received the Smau Innovation Award for having developed a robotic glove for hand rehabilitation. Through simple programming, the glove moves the fingers and accompanies the movements of the hand, adapting to the needs of the patient in active and passive rehabilitation.

Negli anni ‘90, quando è stata fondata, si chiamava CM Ingegneria, ma forse si ricorda meglio come Telerobot Labs. La sua storia è tutta legata all’automazione e nel 2016 ha incrociato i destini del Gruppo Danieli di Buttrio (UD), produttore di impianti siderurgici, che l’ha acquisita. Da sempre si occupa di robotica, dalle applicazioni più specifiche per l’industria pesante (come l’ispezione dei forni di fusione, la manutenzione di tubature) fino a dispositivi a pilotaaggio remoto per monitoraggio di zone contaminate, che si tratti di amianto o di alta radioattività. Suo è il robot utilizzato nelle operazioni di “pulizia” – tecnicamente scarificazione – del camino nella centrale nucleare del Garigliano (FR) in fase di smantellamento, così come sue sono alcune parti del robot bambino iCub.

Con l’IIT ha attivato una collaborazione che dura da anni e non si esaurisce in semplici forniture ma porta uno scambio continuo di conoscenze. L’azienda genovese trova infatti soluzioni per contesti difficili o inaccessibili, ma il suo impegno arriva anche alle persone. Nel 2018 ha ricevuto il premio Innovazione Smau per aver messo a punto un guanto robotico per la riabilitazione della mano. Attraverso una semplice programmazione, il guanto muove le dita e accompagna i movimenti della mano adattandosi alle esigenze del paziente in riabilitazione attiva e passiva.
ROSSINI “RObot enhanced SenSing, INtelligence and actuation to Improve job quality in manufacturing” project started in 2018 and is coordinated by Datalogic for the development of robotic skills for the improvement of the quality of work in manufacturing. The aim is to design and implement a platform for the integration of robotic technologies in applications based on man-machine collaboration. Today’s collaborative robots are safe but slow and capable of carrying minor loads. Industrial robots are fast and powerful, but any interaction with humans is potentially dangerous.

The project aims to overcome this dichotomy. The consortium is made up of long-standing partners in the field of industrial robotics with very different specialisations. This allows for developing new solutions on all components of a robotic station and the whole system. Special attention is to be paid to the interaction between man and robot and to the ergonomic and user-friendliness factors. This will be achieved by improving the products that Datalogic and its partners already manufacture and by developing a new collaborative robotic arm capable of reducing response time. The company from Calderara di Reno (BO) is now a world leader in the field of automatic data collection, with 12 research centres and 3,200 employees in 30 countries.

ROSSINI “RObot enhanced SenSing, INtelligence and actuation to Improve job quality in manufacturing” è un progetto iniziato nel 2018 e coordinato da Datalogic per lo sviluppo delle capacità robotiche per il miglioramento della qualità lavorativa nella manifattura. L’obiettivo è ideare e realizzare una piattaforma per l’integrazione di tecnologie robotiche in applicazioni basate sulla collaborazione uomo-macchina. Gli attuali robot collaborativi sono sicuri, ma lenti e capaci di portare carichi di dimensioni minori. Gli industriali sono veloci e potenti, ma ogni loro interazione con l’uomo è potenzialmente pericolosa. Il progetto ha lo scopo di superare questa dicotomia.

Il consorzio è costituito da partner con lunga esperienza nel campo della robotica industriale con specializzazioni molto diverse. Questo permetterà di sviluppare nuove soluzioni su tutti i componenti di una stazione robotica e sull’intero sistema. Particolare attenzione sarà posta nell’interazione uomo-robot e ai fattori di ergonomia e semplicità d’uso. Ciò attraverso il miglioramento dei prodotti che Datalogic e gli altri partner già realizzano e lo sviluppo di un nuovo braccio robotico collaborativo in grado di ridurre i tempi di reazione. L’azienda di Calderara di Reno (BO) è oggi tra i leader mondiali nel settore dell’acquisizione automatica dei dati, con 12 centri di ricerca e 3200 dipendenti in 30 Paesi.
Interior design, industrial machinery design, brand restyling: in a word, design. That’s the work of ddp Studio, which, since 2009, has been giving shape to everyday objects and spaces. Also Hannes, the robotic hand developed by Centro Protesi Inail of Budrio (BO) and IIT and winner of the national award for innovation “ADI Design Index 2018”, is signed by Lorenzo De Bartolomeis, Gabriele Diamanti and Filippo Poli, who founded the Milan Studio. The prosthesis, named after Johannes Schimidl, author of the first Inail-Ceca myoelectric prosthesis, allows the patient to recover 90% of the functionality and to adapt to objects thanks to the Dynamic Adaptive Grasp system.

Just think of the action needed to transmit to the residual muscles and then to the prosthesis the impulse to make it move. The excellent functionality of Hannes lies in the perfect combination of engineering and aesthetics. To develop it, the team at ddp Studio analysed the proportions of the hand and compared it with the art world and with manufacturers of haute couture mannequins, to obtain the most natural result. The hand harmonises with the rest of the body, is lightweight and aesthetically beautiful. Besides this, ddp Studio has collaborated with Inail and IIT to the realisation of Hunova, the rehabilitation platform that supports the work of physiotherapists.


Basta pensare all’azione da realizzare per trasmettere ai muscoli residui e quindi alla protesi l’impulso per farla muovere. La grande funzionalità di Hannes risiede nel perfetto connubio tra ingegneria ed estetica. Per svilupparla, il team di ddp Studio ha analizzato le proporzioni della mano confrontandosi anche con il mondo dell’arte e con produttori di manichini per l’alta moda, al fine di ottenere il risultato più naturale possibile. La mano si armonizza con il resto del corpo, è leggera ed esteticamente bella. Oltre ad essa, ddp Studio ha collaborato con Inail e IIT per la realizzazione di Hunova, la piattaforma di riabilitazione che supporta il lavoro dei fisioterapisti.
In 2019 it received the Robotic Innovation Award at MECSPE, the most important trade fair dedicated to innovations in the manufacturing industry held annually in Parma (from this year also in Bari). We talk about Demur, a company from Savoca (ME) that specialises in industrial robotics. The “Solution Awards”, now in its fourth edition, recognised the innovation brought by the team of robots for handling citrus crates.

It is not just a simple palletiser, but a solution to pick up adjacent crates (a layer of the stack), lift them, rotate them and empty them with a patented “Soft Drop” system that allows depositing the content in a special processing area. After unloading, the robot brings the crates back to their initial position and stores them on a different platform, stacking them perfectly on the empty ones. This application can handle more than 1000 boxes per hour in about 10 square metres of space. Since 2012, the Messina-based company led by Carlo Depu has been developing solutions for boxing, handling and palletising products, creating electronic interfaces, grippers, lighting systems and software to facilitate the communication between robots and between machines and people.
In Greek mythology it represented power, now it is the support to human work. Cratos (Collaborative robot addressed to operative solution robot) is the first European cobot for the integration of electronic systems on Cosmo-Skymed satellites. The company from Mirandola (MO) Egicon, specialized in the design and production of electrical, electronic and optical control systems, testing and inspection systems that use artificial vision and collaborative robotic systems; realized it with Thales Alenia Space. With approximately 60 employees, half of whom are involved in research and development, the company operates in the automotive, medical, industrial and aerospace sectors and its laboratory is accredited by the Emilia Romagna High Technology Network.

Cratos is a cobot capable of assembling satellite components, continuously monitoring the process and learning automatically. It can “see” objects thanks to recognition algorithms, reducing assembly time. Egicon’s experience began in 2008 with the creation of test stations equipped with anthropomorphic robots to test the integrity of various components. Since then, the company has grown with the creation of machines for testing and inspecting parts, automatically identifying them. With Kuka, it collaborates on the development of cobots for complex assemblies.

Nella mitologia greca rappresentava il potere, ora diventa il supporto al lavoro umano. Cratos (Collaborative robot addressed to operative solution robot) è il primo cobot europeo per l’integrazione di sistemi elettronici su satelliti Cosmo-Skymed. A realizzarlo, con Thales Alenia Space, l’azienda di Mirandola (MO) Egicon, specializzata nella progettazione e produzione di sistemi di controllo elettrici, elettronici e ottici, sistemi di collaudo e ispezione che sfruttano la visione artificiale e sistemi robotici collaborativi. Con circa 60 addetti, di cui la metà impiegata in ricerca e sviluppo, l’azienda opera nei settori automotive, medico, industriale e aerospaziale e il suo laboratorio è accreditato presso la Rete Alta Tecnologia dell’Emilia Romagna.

Cratos è un cobot in grado di assemblare componenti del satellite, monitorando continuamente il processo e aprendo in modo automatico. Può “vedere” gli oggetti grazie ad algoritmi di riconoscimento riducendo i tempi di assemblaggio. L’esperienza di Egicon inizia nel 2008 con la realizzazione di stazioni di collaudo dotate di robot antropomorfi per testare l’integrità di vari componenti. Da allora l’azienda è cresciuta con la realizzazione di macchine per collaudare e ispezionare pezzi, identificandoli automaticamente. Con Kuka collabora per lo sviluppo di cobot per assemblaggi complessi.
Designing a robot to work perfectly is not enough to make it useful to man; its shape must be familiar, adaptable and straightforward: in other words, mechatronics must be accompanied by design. Especially when it comes to prosthetics, beauty and functionality are never minor components. Evidence of it is the robotic hand Mia, winner in 2019 of the Red Dot Design Award, one of the most important international awards for design. Elastico Disegno, an architecture and design studio in Chieri (TO), designed the prosthesis. The studio worked with the engineers of Prensilia, creators of the hand. The hand has been awarded for combining a beautiful aesthetic profile with excellent functionality, responding to the needs for which it was designed.

The sensors that control its movements are surgically connected to the nerve endings still present on the limb, and its structure is designed for daily, continuous and long-lasting use. The motor and electrical circuits located in the palm are protected by an interchangeable and customizable shell, while the fingertips are made of soft silicone. The design was carried out by the two teams together as part of the DeTOP project funded by the European Community for Horizon 2020, and in 2019 the first experimental plant of Mia has been built in Sweden.
Men capable of great deeds are often driven by a dream. Enrico Grassi and Vittorio Cavirani, President and General Manager of Elettric80, dared to turn that dream into reality, founding a world-renowned mechatronics centre in Viano (RE) in the 1980s. Elettric80 is specialized in the realization of automated logistics solutions for companies that produce consumer goods. In 1992 BEMA was founded to develop robotic systems in synergy with those of the Viano-based company.

Thanks to innovative technologies and through the analysis of customers’ logistic processes, Elettric80 has pioneered the concept of Industry 4.0. Tailor-made solutions allow managing every supply chain activity, increasing factory efficiency and product traceability. The SM.I.LE80 (Smart Integrated Logistics) software platform controls the logistics flow. It ensures system integration and optimized management of all operations, from the entrance of raw materials to storage and shipment. Today the company has more than 800 employees and 13 branches worldwide; it has built approximately 300 integrated factories, installed more than 2,000 robotic systems, 4,500 automatic laser-guided vehicles and offers remote and on-site service 24 hours a day. Thanks to constant investment in the territory and young people, the dream goes on.

Gli uomini capaci di grandi imprese spesso sono mossi da un sogno. Enrico Grassi e Vittorio Cavirani, Presidente e Direttore Generale di Elettric80, hanno avuto il coraggio di trasformarlo in realtà, fondando a Viano (RE), negli anni ’80, un centro della meccatronica riconosciuto oggi a livello mondiale. Elettric80 è infatti specializzata nella realizzazione di soluzioni logistiche automatizzate per imprese produttrici di beni di largo consumo. Nel 1992 nasce BEMA per sviluppare sistemi robotizzati sinergici con quelli dell’azienda di Viano.

Grazie a tecnologie innovative e attraverso l’analisi dei processi logistici dei clienti, Elettric80 ha anticipato il concetto di Industry 4.0. Le soluzioni tailor-made permettono di gestire tutte le attività della supply chain aumentando l’efficienza di fabbrica e la tracciabilità dei prodotti movimentati. Il flusso logistico è gestito dalla piattaforma software SM.I.LE80 (Smart Integrated Logistics) che assicura l’integrazione dei sistemi e la conduzione ottimale di tutte le operazioni, dall’ingresso delle materie prime allo stoccaggio fino alle spedizioni. Oggi l’azienda conta oltre 800 dipendenti e 13 filiali in tutto il mondo; ha realizzato circa 300 fabbriche integrate, installando oltre 2,000 sistemi robotizzati e 4,500 veicoli automatici a guida laser e offre un servizio di assistenza da remoto e in loco h 24. Grazie all’investimento costante su territorio e giovani, il sogno continua.
Among ENEA's many fields of research, robotics is a must. The Distributed Intelligence and Robotics Laboratory for the Environment and the Person located in Casaccia (RM) is responsible for the design and production of submarine, terrestrial, space and "service" robots. Many projects are being developed here, including "HARNESS", for the creation of a swarm of autonomous submarines for environmental monitoring and safety. VENUS is the prototype of an autonomous submarine that is going to be the core unit of the swarm, with sensors and detection systems able to collect data from the surroundings.

ENEA has brought robotics to the Antarctic research program with RAS (Surface Antarctic Robot), capable of moving alone or guided at a distance on the Antarctic ground to collect information and data; and SARA (Autonomous Robotized Antarctic Submarine). PRASSI is the robot for inspections and surveillance of installations and hazardous areas. MASCOT is international excellence for work in the nuclear environment; the servo-controlled manipulator that supports human action by transmitting sensory information about the applied force. ENEA also works for people with special needs; a version of the humanoid robot NAO is currently being developed to help autistic children engage with people.
Researchers at Era Endoscopy, a spin-off of the Sant’Anna School of Advanced Studies of Pisa located in Peccioli (PI), have studied what already exists in nature (biomimicry) and have been inspired by the inchworm. They have developed the Endotics technology for safe and painless colonoscopy. Endotics is a robotic system consisting of a flexible probe that, when inserted in the colon, moves like a caterpillar. It stretches and shortens the central part of the body and anchors its ends to the intestine walls through a sort of suction cup, without causing any pain.

Unlike traditional endoscopes, which require that the organ adapts to their advance, Endotics moves to adjust to the surrounding environment, is managed by the practitioner via a joystick, thus avoiding the risk of perforation resulting from manual external thrust. Its flexible shape allows it to pass even in the most critical points of the intestine without the risk of causing injury and without any need for anaesthesia. Endotics, like the traditional system, is equipped with an operator channel for the use of surgical instruments (pliers, loops, etc.). In addition to being painless, it is safe: while traditional endoscopes, which cannot be sterilized, must be disinfected every time, Endotics is disposable. The system is portable, can be used outside the hospital and controlled remotely.

A differentia dei tradizionali endoscopi, che prevedono che l’organo si adatti alla loro avanzata, Endotics si muove adattandosi all’ambiente circostante, gestito dall’operatore tramite un joystick, evitando il rischio di perforazione derivante dalla spinta manuale esterna. La sua forma flessibile gli consente di passare anche nei punti più critici dell’intestino senza pericolo di causare lesioni e senza necessità di anestesia. Endotics, come il sistema tradizionale, è dotato di canale operator per l’utilizzo di strumenti chirurgici (pinze, anse, ecc.). Oltre ad essere indolore, è sicuro: mentre gli endoscopi tradizionali, non sterilizzabili, devono essere disinfettati ogni volta, Endotics è monouso. Il sistema è portatile, utilizzabile anche fuori dall’ospedale e controllabile a distanza.
Among the five finalists of the Italian Mechatronics Award in 2018, Fameccanica is a company that has believed in digital ever since IoT was still a topic for experts without any practical feedback from factories. Founded in 1975 for the design and construction of machines for sanitary absorbent products, today it is the world’s largest producer and has expanded its activities in the liquid filling sector. It has over 750 employees and plants in Italy, China and the USA, with headquarters in San Giovanni Teatino (CH).

Fameccanica has often been ahead of its time by introducing pioneering technological innovations into its sector. In 1996 the first machine completely managed by servomotors; in 2009 the first fully automatic systems for loading and unrolling materials; in 2012 a digital transformation process that led to production monitoring systems, interactive documentation, speeding up of changeovers, consumption optimisation, as well as 3D virtual reality solutions for simulating the machine and checking its accessibility and maintainability in advance. Together with universities, partner companies and the Istituto Italiano di Tecnologia, Fameccanica has invested heavily in integrating robotic solutions targeted at customers who wish to automate the materials management process from their warehouses to the preparation and feeding of the machines.
Technology should make our life easier, but innovation may create exclusion: the digital divide leads to a lack of access to new technologies for part of the population. The work of Fondazione Mondo Digitale is essential because it democratises knowledge, allowing the elderly, children and the weak to meet new worlds such as robotics, which needs to be explained to become part of everyone’s heritage.

The non-profit Foundation, established in Rome in 2001 as Consorzio Gioventù Digitale, participated in the Robodidactics project in 2006, which aimed to develop a methodology for introducing robotics in schools as a teaching and learning support for scientific and IT subjects. Since then, many projects have been launched, including RomeCup, an event that, with conferences, demonstrations, orientation sessions and challenges between schools, brings together the school, academic and business worlds for exchanging experiences and ideas. At its thirteenth edition, every year RomeCup involves about 5000 people, allowing the winners of robotics competitions to access other tournaments such as the RoboCup world robotics championship. The Foundation was also the promoter, together with MIUR, of the first edition of the Robotics Olympics and is the founder of the multi-sector network for educational robotics in Italy.

La tecnologia dovrebbe semplificarsi la vita, ma l’innovazione può creare esclusione: il “digital divide” causa il mancato accesso alle nuove tecnologie di parte della popolazione. Il lavoro di Fondazione Mondo Digitale è importante perché democratizza la conoscenza, consentendo anche ad anziani, bambini e fasce deboli di entrare in contatto con mondi nuovi come la robotica, che necessita di essere spiegata per diventare patrimonio di tutti.

La Fondazione non profit, nata a Roma nel 2001 come Consorzio Gioventù Digitale, ha iniziato a occuparsene nel 2006 partecipando al progetto Robodidactics che aveva lo scopo di sviluppare una metodologia per introdurre nelle scuole la robotica come supporto nell’insegnamento e nell’apprendimento di materie scientifiche e informatiche. Da allora tanti i progetti attivati, tra cui RomeCup, evento che tra convegni, dimostrazioni, sessioni di orientamento e sfide tra scuole, chiama a raccolta mondo scolastico, accademico e imprenditoriale per uno scambio di esperienze e idee. Giunta alla XIII edizione, ogni anno coinvolge circa 5000 persone, dando la possibilità ai vincitori delle competizioni robotiche di accedere ad altri tornei quali i mondiali di robotica RoboCup. La Fondazione è stata anche la promotrice, insieme al MIUR, della prima edizione delle Olimpiadi di Robotica ed è la fondatrice della Rete multisettoriale per la robotica educativa in Italia.
Many factors determine the growing success of the use of robots in production processes. For example, robots can perform the same operation millions of times, with maximum reliability and repetition, moving weights that cannot be managed by operators and working in environments where exposure to dust or harmful substances could be detrimental to humans. The production of ceramic sanitaryware is another case in which the introduction of robots in the factory has significantly improved the production performance and the working conditions of operators.

Gaiotto is the world’s leading company in the production of robotic systems for the manufacture of sanitaryware. The Piacenza-based company, operating since the 1960s, is part of the Sacmi Group and has always been looking for efficient solutions to meet the needs of the sector. Gaiotto has been ahead of its time developing solutions to facilitate the use of industrial robots. The implementation of self-learning procedures allows its glazing robots to be programmed directly by the line operator that can move them. By recording these movements, the robots can repeat them over and over without human intervention. Alternatively, Gaiotto has developed a simulation software that allows to define the mission of the robot in a virtual environment and to replicate it in-line.

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Il successo crescente dell’utilizzo dei robot nei processi produttivi è determinato da molteplici fattori. I robot sono ad esempio in grado di eseguire milioni di volte la stessa operazione, con la massima affidabilità e ripetibilità, movimentando pesi non gestibili dagli operatori e lavorando in ambienti dove l’esposizione a polveri o a sostanze nocive potrebbe essere dannosa per gli esseri umani. La produzione dei sanitari realizzati in ceramica è uno dei casi in cui l’introduzione in fabbrica dei robot ha consentito di migliorare in modo significativo le performance produttive e le condizioni di lavoro degli operatori.

Italy is the only country in the world to have a national edition of the global robotics and aerospace programming competition Zero Robotics. Every year, so many Italian teams take part in the international competition (in the 2018/19 edition, Italy has brought 25 teams out of approximately 180) that it is possible to hold a national championship. In the challenge, high school students compete by developing programs capable of making the SPHERES (Synchronized Position Hold Engage and Reorient Experimental Satellites) move. SPHERES are mini 18-sided satellites created mainly for teaching purposes by the MIT (Massachusetts Institute of Technology) and permanently positioned inside the International Space Station (ISS).

The IIS “Sansi Leonardi Volta” of Spoleto (PG) won the first place of the Italian Championship of Zero Robotics, overtaking the students of the LSS Galileo Ferraris of Turin (second place). IIS Giulio Natta of Rivoli (TO), came third, ex aequo with Liceo Filippo Juvvara of Venaria Reale (TO). The finals took place in Erice (TP), at Ettore Majorana Centre for Scientific Culture, a reality created and chaired by the physicist Antonino Zichichi. Here the students of IIS “Sansi Leonardi Volta” won thanks to the team “LSA Spoleto A. Volta”, defeating the other 22 teams.

L’Italia è l’unico Paese al mondo ad avere un’edizione nazionale della competizione mondiale di programmazione robotica e aerospaziale Zero Robotics: ogni anno infatti sono così numerosi i team italiani che partecipano alla gara internazionale (nell’edizione 2018/19 l’Italia ha portato 25 squadre su circa 180) da consentire la realizzazione di un campionato nazionale. Nella sfida, gli studenti dei licei gareggiano sviluppando programmi capaci di far compiere dei movimenti agli SPHERES (Synchronized Position Hold Engage and Reorient Experimental Satellites), ovvero dei mini satelliti a 18 facce realizzati, soprattutto per la didattica, dal MIT (Massachusetts Institute of Technology) e posizionati stabilmente all’interno della Stazione Spaziale Internazionale (ISS).

L’IIS “Sansi Leonardi Volta” di Spoleto (PG) si è aggiudicato il primo posto del Campionato Italiano di Zero Robotics, superando gli studenti del LSS Galileo Ferraris di Torino (secondo posto) e dell’IIS Giulio Natta di Rivoli (TO), arrivati al terzo posto ex aequo con i ragazzi del Liceo Filippo Juvvara di Venaria Reale (TO). La finale si è svolta a Erice (TP), al Centro di Cultura Scientifica Ettore Majorana, realtà creata e presieduta dal fisico Antonino Zichichi; qui gli studenti dell’IIS “Sansi Leonardi Volta” hanno riportato la vittoria grazie al team “LSA Spoleto A. Volta”, sconfiggendo le altre 22 squadre partecipanti.
Climbing plants, quadrupeds, exoskeletons and more: Italian robotics dwells at the Italian Institute of Technology (IIT), a research centre based in Genoa with 12 offices in Italy and the USA. A few years ago, IIT created Plantoide, the first plant-inspired robot capable of reacting to external stimuli and of extending its roots in the ground while collecting environmental data. In 2019 comes the robot that coils like a vine shoot using the principle of osmosis, activated by a battery. These are just two of the many projects of IIT, also in collaboration with other research institutes and companies. Everybody knows iCub, the robot child, designed in Genoa by an international team: it is used by researchers to improve perception, movement, interaction between man and robot.

Alongside humanoids, IIT has created quadrupeds such as HyQ Real and Centauro designed to intervene in high-risk areas and agriculture. Then there is Co-Aware: the world’s first ergonomic system for man-robot collaboration, operating in real time, which won the Kuka Innovation Award in 2018. Last but not least there are prosthetics, with a project created by the Rehab Technologies IIT-Inail laboratories for the creation of Hannes, a robotic hand that restores 90% of the functionality of a natural limb and is controlled by electrical signals coming from the residual muscles of the limb.
Made in Italy manufacturing has many records, but in a particular sector, it has reached the highest level: the packaging industry. Our country is among the first in the world for the production of packaging machines, and IMA is a world leader in the sector. With about 6,000 employees and 45 plants worldwide, the Vacchi family company, based in Ozzano dell’Emilia (BO), produces automatic machines for packaging pharmaceutical, cosmetic, food, tea and coffee products. For example, IMA machines are used to produce 70% of the world’s tea bags. For such a company, digitalization is an opportunity to stay competitive.

For this reason, a few years ago IMA Digital was launched, a project dedicated to the introduction of digital technologies into production processes and the development of the smart factory, where automation assists and supports people in the most repetitive operations. Most importantly, the analysis of data allows improving performance even in terms of predictive maintenance. IMA has launched a project for man-robot collaboration in the packaging sector, developing algorithms able to guide the robot in recognizing objects, picking them up and placing them on the machine. This system is equipped with sophisticated software and a 3D vision system, capable of working alongside man.
It grasps objects and moves naturally, but instead of bones and tendons there is a highly advanced technology, result of the work of Rehab Technologies IIT - Inail Lab of Genoa, a joint initiative born in 2013 from the collaboration between Centro Protesi Inail of Vigorso di Budrio (BO) and the Italian Institute of Technology (IIT). In addition to prevention, Inail is committed to improving the quality of life of injured workers.

Introduced in 2018, Hannes hand is a jewel of robotic prosthetics. Two sensors placed in its socket, in contact with the muscles of the residual part of the arm, detect its movements and transfer the information to the wrist and hand that move accordingly. The prosthesis does not require invasive surgery but clings to the residual limb. The patented Dynamic Adaptive Grasp mechanism that moves the fingers allows the hand, through a single motor, to adapt to external shapes and stresses. Thanks to its thumb, which moves in three directions, Hannes can grasp heavy objects or manipulate small ones, even moving the wrist in five positions. A software connected via Bluetooth with the hand, calibrates the parameters to adapt it to the needs of the user and coating gloves make it suitable for men and women. It is no coincidence that the Association for Industrial Design has awarded Hannes with the National Prize for Innovation “ADI Design Index 2018”.

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Affera oggetti e si muove naturalmente, ma al posto di ossa e tendini c’è una tecnologia avanzatissima, frutto del lavoro del Rehab Technologies IIT – Inail Lab di Genova, iniziativa congiunta nata nel 2013 dalla collaborazione tra Centro Protesi Inail di Vigorso di Budrio (BO) e Istituto Italiano di Tecnologia (IIT). In addition to prevention, Inail is committed to improving the quality of life of injured workers.

Presentata nel 2018, la mano Hannes è un gioiello di protesi robotica. Due sensori posti nel suo invaso, a contatto con i muscoli della parte residua del braccio, ne rilevano i movimenti trasferendo l’informazione al polso e alla mano che si muovono di conseguenza. La protesi non necessita di interventi invasivi ma si applica sul residuo dell’arto. Il meccanismo brevettato che fa muovere le dita, Dynamic Adaptive Grasp, consente alla mano, attraverso un unico motore, di adattarsi a forme e sollecitazioni esterne. Grazie al pollice che si orienta in tre direzioni, Hannes può afferrare oggetti pesanti o manipolarne di piccoli, muovendo anche il polso in cinque posizioni. Un software collegato via Bluetooth con la mano permette di calibrare i parametri per adattarla alle esigenze dell’utilizzatore e guanti di rivestimento la rendono adatta ad uomo e donna: non a caso l’Associazione per il Disegno Industriale l’ha premiata con il Premio nazionale per l’innovazione “ADI Design Index 2018”.
Not all young people go abroad to achieve their dreams: some stay in Italy and seize available opportunities. Nicolò Bordoli was only 19 years old when he took part in a call for tender by the Lombardy Region for innovative companies; he had little experience but clear ideas. He wanted to start his own business and create jobs for other people. He won the call, and his Inventio settled in the Innovation Hub ComoNext in Lomazzo (CO). Today it is a private company that designs and develops tailor-made electronics and software solutions for robotics and industrial automation.

In collaboration with Caracol, another company based in ComoNext, Inventio has created Scalprum 13800, a 3D printing extruder designed for assembly on 6-axis robotic arms for use in the aerospace, automotive, marine, motorsport and more generally for additive manufacturing using high-performance materials on large volumes. Inventio’s first project is Primus, the robotic development platform designed for use by both basic and advanced users. The 30 cm long robot is suitable for indoor use but can move on any surface, and its software interfaces allow it to be programmed either by a beginner through a block diagram, or by more experienced users through Arduino or by intervening directly on the electronic control.

Non tutti i giovani partono per coronare i propri sogni: alcuni restano in Italia e colgono le opportunità che ci sono qui. Aveva soltanto 19 anni Nicolò Bordoli quando partecipò a un bando della Regione Lombardia per le imprese innovative: poca esperienza ma idee chiare. Voleva fondare una sua impresa e creare lavoro per altre persone. Vinse il bando e la sua Inventio si insediò nell’Innovation Hub ComoNext a Lomazzo (CO). Oggi è un’azienda individuale che progetta e sviluppa soluzioni di elettronica e software su misura per robotica ed automazione industriale.

In collaborazione con Caracol, un’altra azienda insediata a ComoNext, Inventio ha dato vita a Scalprum 13800, un estrusore per la stampa 3D ideato per il montaggio su bracci robotici a 6 assi per impieghi nel settore aerospaziale, automotive, nautico, motorsport e più in generale per la manifattura additiva tramite materiali tecnici molto performanti e su grandi volumi. Il primo progetto di Inventio è Primus, la piattaforma di sviluppo robotica pensata per l’utilizzo da parte di utenti con competenze sia basilari che avanzate. Il robot lungo 30 cm è adatto per l’interno ma può muoversi su qualsiasi terreno e le sue interface software gli consentono di essere programmato sia da un principiante attraverso uno schema a blocchi, sia da utenti più esperti tramite Arduino o intervenendo direttamente sull’elettronica di controllo.
I-RIM, Institute of Robotics and Intelligent Machines is a non-profit association created to intertwine the Italian research excellence with the world of business, bringing together all the protagonists of Made in Italy robotics. Just like the slogan, “Let’s give shape to artificial intelligence,” I-RIM wants to bring the most innovative technologies into everyday life, integrating artificial intelligence with people’s lives. To do so, I-RIM intends to set the concept of “machine” free from the many false myths that bind it, to interpret it as an improvement of living and working conditions, help for the elderly and disabled, diagnostic and surgical progress, productive sustainability and above all economic valorization of the research activity. This is done by protecting the interests of those who study and invest in robotics and automation, and by facilitating the matching between supply and demand at national and international level. The Institute acts as an accelerator to promote industrial implementation, identify technological needs and transform research into products. I-RIM, founded in July 2019 by important personalities of Italian robotic research, was officially presented in Rome in October, during three days dedicated to intelligent machines, organized in collaboration with Maker Faire - The European Edition 2019.

Proprio l’Italia ha trionfato nel gennaio 2019 con due squadre dell’Istituto d’Istruzione Superiore Avogadro di Vercelli: una è diventata campione mondiale di Zero Robotics vincendo la gara di programmazione dei robot presenti a bordo della ISS, l’altra è arrivata prima nella competizione virtuale, la cui finale si è comunque svolta a bordo della ISS, in alleanza con il liceo F. Vercelli di Asti ed una squadra americana. La squadra vincitrice assoluta del torneo mondiale, Naughty Dark Spaghetti, è composta da The Dark Team of LSA (i.e. the students of the IIS Avogadro) e due team americani: i ragazzi si sono imposti su un totale di circa 180 scuole iscritte, di cui 25 italiane.
A car that comes off the ground and gets airborne is a spectacular picture. It seems to be coming out of the imagination of a child, and perhaps many have dreamt of owning one. In the not so distant future, we can use it. For now, there is a prototype designed, developed and built by Italdesign. A 1:4 scale model of Pop.Up Next was presented during the Drone Week in Amsterdam on November 2018, where it made its first test flight in entirely autonomous mode. The prototype suggests something related to science fiction. It consists of three parts: an airborne module, a passenger capsule and a ground module.

The capsule, connecting to the ground module, becomes an electric and self-driven car. For overcoming an area of high traffic density, the cabin can detach from the ground module and dock to the air module that, taking off and landing vertically, quickly brings passengers to their destination. Pop.Up Next aims to overcome the problems of road traffic congestion by using the air route as a sustainable alternative. The shapes were created by Italdesign, which celebrated its 50th anniversary with this project. Founded in 1968 by Giorgetto Giugiaro and Aldo Mantovani, the Turin-based company has accompanied the history of the automobile with projects that bring the future closer.

Un’auto che si stacca da terra e prende quota è un’immagine che ha del favoloso. Sembra uscire dalla fantasia di un bambino e forse molti hanno sognato di averla a disposizione. In un futuro non così lontano potremo realmente usarla. Per ora ne esiste un prototipo ideato, sviluppato e costruito da Italdesign. Un modello in scala 1:4 di Pop.Up Next è stato presentato durante la Drone Week di Amsterdam nel novembre 2018, dove ha effettuato il primo volo di test in modalità completamente autonoma; a vederlo fa pensare a qualcosa di fantascientifico. Si compone di tre parti: un modulo aereo, una capsula per il trasporto passeggeri e un modulo terrestre.

La capsula, agganciandosi al modulo terrestre, diviene di fatto un’auto elettrica e a guida autonoma. Per spostamenti che implicano il superamento di una zona ad alta densità di traffico, la cabina può sganciarsi dal modulo terrestre ed agganciarsi al modulo aereo che, decollando e atterrando verticalmente, porta velocemente i passeggeri a destinazione. Pop.Up Next ha l’obiettivo di superare i problemi legati alla congestione del traffico stradale utilizzando la via aerea come alternativa sostenibile. Le forme sono frutto del lavoro di Italdesign, che ha festeggiato con questo progetto i suoi 50 anni. Fondata nel 1968 da Giorgetto Giugiaro e Aldo Mantovani, la società torinese ha accompagnato la storia dell’automobile con progetti che rendono il futuro più vicino.
Technology makes everything more familiar and even allows to wear robots. IUVO was founded in 2015 to develop wearable robotic systems and promote their use in various fields, from medicine to industry. IUVO, based in Pontedera (PI) is a spin-off from the wearable robotics laboratory of the Biorobotics Institute of the Sant’Anna School of Advanced Studies of Pisa.

In 2017 COMAU (an FCA group company, leader in robotics and industrial automation) and the Icelandic company Össur (leader in the field of lower-limb prosthetics) decided to invest in IUVO by creating a joint venture that owns the majority of the company, and in which COMAU is the majority shareholder.

In the industrial field, IUVO has developed MATE, a passive upper limb exoskeleton that is commercialized by COMAU. This system helps the operators who wear it to reduce the effort in those jobs where they perform handling tasks with their arms raised. In the medical sector, IUVO is developing a walking assistance system that will be launched on the market by Össur. IUVO is also very active in collaborating on European scientific research projects. It is a partner in the H2020 CYBERLEGs Plus Plus, H2020 EUROBENCH and H2020 INBOTS projects.
Born on the basis of the research carried out by Dr Lamberto Piron on the use of virtual reality in neurological recovery at MIT in Boston, since 1998 Khymeia has been developing devices with a high rate of technological innovation for the medical sector, with a particular focus on rehabilitation. In a global context of constant growth of life expectancy and concurrent increase of pathologies, Khymeia boasts an extensive portfolio of particularly innovative solutions, including the VRRS—Virtual Reality Rehabilitation System ecosystem, the most advanced, complete and clinically tested virtual reality medical device for rehabilitation and telerehabilitation in the world.

The platform is a “brain” to which many specialized peripheral devices can connect according to specific rehabilitation needs, from neurological to cognitive, speech, postural, orthopaedic, respiratory and many more. Once discharged, the patient is provided with a briefcase with which to undergo rehabilitation therapies from home. It is possible either off-line, assisted by an integrated interactive “smart virtual assistant”; or online, connected in real-time with the therapist; the kinematic, infrared and light detection sensors allow to perform motor telerehabilitation. VRRS is the only system in the world to do so.
Leonardo is a leading international industry champion, among the top 10 companies in the world in the aerospace, defence and security sectors, with revenues of over €12 billion and R&D investments representing 12%. More than 46 thousand employees worldwide, 29 thousand of them in Italy and products reaching 150 countries. Excellence that brings the best Italian technology also to Space. Soon it will reach Mars with a fundamental component for the exploration of the red planet.

The ExoMars mission, in collaboration with ASI, ESA and the Russian Space Agency with the contribution of NASA, started in 2016 with the launch of a device to detect gas in the atmosphere. The mission will continue in 2020 with an autonomous European rover that will take samples from Martian soil to analyze it and learn about the environment, looking for traces of life present or past. The rover will dig the surface, arriving at a depth of two meters where the external interference is not relevant. Leonardo will produce the drill for this operation in its plant in Nerviano (MI). In 2018, the testing in an environment similar to that of Mars was completed. The drill will operate at temperatures between -100°C and +35°C, will have a power of one-fifth of household drills (about 80 watts) and a polycrystalline diamond tip to make a 25 mm diameter hole.
Since 1968 Loccioni has been the leading innovator with tailor-made solutions for various needs, from intelligent storage to industrial automation. In the laboratories of Rosora (AN) serial production does not exist, there is only the custom-made. The company develops integrated robotic systems for quality control on every level and various sectors, including automotive, aerospace and health. On the health front, APOTECaChemo, Loccioni’s robotic system, is already operating in hospital pharmacies all over the world. It produces chemotherapeutic preparations (specific for each patient), directly following the prescription, avoiding exposure to toxic materials and incorrect administration by staff and patients.

In view of industry 4.0, Loccioni has developed several applications in which robots give flexibility to sensors (i.e. cameras) and has developed the Open Robot Interface (ORI) which aims to provide a single interface for low-level programming of robots. Each machine has, in fact, a specific programming language. In 2017 Loccioni won the SMAU Innovation Award with a modular robotic system consisting of modules with individual intelligence but capable of communicating with each other. This system can recognize and decide on a reference point from which to operate, reconfiguring itself as needed.

Dal 1968 Loccioni è protagonista dell’innovazione con soluzioni su misura per varie esigenze, dallo storage intelligente all’automazione industriale. Nei laboratori di Rosora (AN) la produzione seriale non esiste, c’è solo il su misura. L’impresa sviluppa sistemi robotici integrati per il controllo qualità su tutta la linea e per vari settori, tra cui automotive, aerospazio e salute. Sul fronte della salute, è già operativo nelle farmacie ospedaliere di tutto il mondo APOTECaChemo, sistema robotizzato Loccioni in grado di realizzare preparazioni chemioterapiche (specifiche per ogni paziente), seguendo direttamente la prescrizione, evitando agli operatori l’esposizione a materiali tossici e ai pazienti somministrazioni errate.

In ottica di industria 4.0, ha realizzato diverse applicazioni in cui i robot sono utilizzati per dare flessibilità ai sensori, quali ad esempio telecamere, e ha sviluppato la Open Robot Interface (ORI) che mira a fornire un’interfaccia unica di programmazione a basso livello dei robot: ogni macchina infatti ha il suo linguaggio di programmazione specifico. Nel 2017 ha vinto il Premio Innovazione SMAU con un sistema robotico modulare composto da moduli dotati di intelligenza propria ma in grado di comunicare tra di loro. Questo sistema può riconoscere e decidere un punto di riferimento da cui partire per effettuare un’operazione, riconfigurandosi in base alle necessità.
Anyone can, with the help of simple and low cost technologies, create their own little robot. In Maker Faire Rome’s DNA you can find this too. Organized by the Chamber of Commerce of Rome, Maker Faire Rome - The European Edition was born in 2013 as the European edition of Maker Faire in San Francisco (2006) and has become the largest Maker Faire in the world (out of a total of 220 fairs in 400 countries) for number of visitors: 105 thousand visitors in the 2019 edition. “Make:,” the first magazine entirely dedicated to technological projects based on open software and open hardware, and Maker Faire, which from “Make:” was born, are the tip of the iceberg of a global movement in which consumers are aware of the possibility of playing an active role in the invention of technological everyday objects and become protagonists inventing, designing, exchanging information and free software.

The fair focuses on robotics that interact and help man in everyday life. During the last edition it was possible to admire from robotic musicians to robots playing football, programmed through artificial intelligence, up to technologies for improving health and quality of life and assisting in work, from wearable devices to drones for monitoring sites that are dangerous for man. The fair also hosted the first conference of the newborn I-RIM, Institute of Robotics and Intelligent Machines, which represents the best of the Italian Academy in the field.
Have you ever met Toni, the bartender who can prepare more than 80 drinks in an hour by handling 158 different bottles at a time? He’s from Turin, makes any cocktails you want, and above all, he’s 100% a robot! Not just any robot: it’s the first robotic bar in the world. Besides him, there is Bruno, the “portable” version, a container with the mechanical structure ready to use, and Guido, just a concept of what could be the bar of the future, for now. All products are signed by Makr Shakr, a Turin company that brings industrial machines from the factory to the city, inventing new interactions between man and robots.

In detail, Toni and Guido have two mechanical arms each and behave like real barmen. They prepare drinks, shake and even dance, transforming the creation of the cocktail into a 360-degree entertainment. Entertainment, but also sociality: customers order the cocktail through the app, choosing from the menu or customizing it, then always on the platform pay and share their recipes. The Makr Shakr robotic bar, also designed by Carlo Ratti Associati, is sold worldwide, but if you want to try its cocktails in Italy, you must go to The View by Makr Shakr Rooftop, in Piazza del Duomo in Milan.

Avete mai conosciuto Toni, il bartender capace di preparare più di 80 drink in un’ora gestendo 158 diverse bottiglie alla volta? È di Torino, prepara qualunque cocktail desideriate, e soprattutto... è un robot al 100%! Ma non uno qualunque: si tratta del primo bar robotico al mondo. Oltre a lui ci sono anche Bruno, ovvero la versione “portatile”, un container con all’interno la struttura meccanica pronta all’uso, e Guido, per ora solo un concept di quello che potrebbe essere il bar del futuro. Tutti i prodotti sono firmati Makr Shakr, azienda torinese che porta le macchine industriali dalla fabbrica alle città, inventando nuove interazioni tra l’uomo e il robot.

Nello specifico, Toni e Guido sono composti ognuno da due braccia meccaniche e sono capaci di comportarsi come veri e propri barman: preparano drink, shakerano e ballano perfino, trasformando la creazione del cocktail in un intrattenimento a 360 gradi. Intrattenimento, ma anche socialità: i clienti ordinano il drink tramite l’app, scegliendo dal menù oppure personalizzandolo, poi sempre sull’apposita piattaforma possono pagare il cocktail e condividere le loro ricette. Il bar robotico Makr Shakr, firmato anche dallo studio Carlo Ratti Associati, è venduto in tutto il mondo, ma se volete provare i suoi cocktail in Italia dovete andare al The View by Makr Shakr Rooftop, in piazza del Duomo a Milano.
Where companies and training institutions generate an exchange, continuous innovation occurs because there is continuity between skills and new ideas. This is the case in the Bari mechatronics district, where multinationals, SMEs, Polytechnics and Higher Technical Institutes create a winning system. One of the protagonists is Masmec, a company from Modugno (BA) that produces assembly and testing lines for the automotive sector. Recognized in 2019 as a “Welfare Champion” by the Welfare Index PMI, which analyses the welfare level of Italian SMEs, Masmec has just celebrated thirty years of activity and is among the first companies to integrate robotics into assembly lines.

Today it has about 250 employees, who are also involved in the Biomed division, devoted to biomedical solutions, from navigation devices that guide doctors during surgery to workstations for diagnostic and research laboratories. In 2018 Masmec launched the ARONA project as coordinator, to study and create a robotic system prototype for minimally invasive surgery assisted by a navigator in virtual and augmented reality. This system will make it possible to overcome the difficulties of current techniques, making the surgeon’s actions more reliable and precise, even in the absence of perfect or complete visibility of the operating field.

Laddove imprese e istituzioni formative generano uno scambio si crea innovazione continua perché c’è continuità tra competenze e nuove idee. È così nel distretto della meccatronica barese, dove multinazionali, pmi, Politecnico e Istituti Tecnici Superiori danno vita a un sistema vincente. Uno dei protagonisti è Masmec, azienda di Modugno (BA) produttrice di linee di assemblaggio e test per il settore automotive. Riconosciuta nel 2019 “Welfare Champion” dal Welfare Index PMI, che analizza il livello di welfare delle pmi italiane, ha compiuto da poco trenta anni di attività ed è stata tra i primi a integrare la robotica nelle linee di assemblaggio.

Oggi conta circa 250 dipendenti, impegnati anche nella divisione Biomed, dedicata alle soluzioni per il biomecnilce, dai dispositivi di navigazione che guidano i medici durante gli interventi chirurgici alle workstations per i laboratori di diagnostica e di ricerca. Nel 2018 ha avviato come coordinatore il progetto ARONA, con l’obiettivo di studiare e realizzare un prototipo di sistema robotico per la chirurgia mini-invasiva assistito da un navigatore in realtà virtuale e aumentata. Questo sistema consentirà di superare le difficoltà delle tecniche attuali, rendendo più affidabili e precise le azioni del chirurgo, anche in mancanza di una perfetta o completa visibilità del campo di intervento.
If the notorious Zeno of Italian literature came to life from the pen of Italo Svevo, the most famous one of robotics was born from a group of professors and researchers of the Department of Industrial Engineering of the University of Florence, which in 2012 founded the spin-off company MDM Team. Zeno (Zeno Environment Nautical Operator) is an autonomous underwater vehicle (AUV), a sort of underwater drone created for underwater archaeological missions during the European project ARCHEOSUb (Autonomous underwater Robotic and sensing systems for Cultural HEritage discovery cOnservation and in SitU valorization), which aims above all to create a low-cost but high-performance AUV, capable of researching, inspecting, preserving and protecting the archaeological heritage of the underwater world.

MDM Team has designed, built and tested Zeno, which has distinguished itself for its high performance in terms of manageablebility and speed in changing batteries (45 seconds the duration of the replacement for about 4 hours of autonomy). The use of Zeno is not limited to the archaeological field, however, but can be extended to safety and port security or even environmental monitoring. Thanks to Zeno and the competence of its team of professionals, MDM Team is one of the leading players in the field of underwater robotics.

Se lo Zeno più noto della letteratura italiana ha preso vita dalla penna di Italo Svevo, quello più famoso della robotica nasce invece da un gruppo di professori e ricercatori del Dipartimento di Ingegneria Industriale dell’Università di Firenze, che nel 2012 ha fondato la società spin-off MDM Team. Zeno (Zeno Environment Nautical Operator) è infatti un veicolo autonomo sottomarino (AUV), una sorta di drone subacqueo creato per le missioni archeologiche in immersione durante il progetto europeo ARCHEOSUb (Autonomous underwater Robotic and sensing systems for Cultural HEritage discovery cOnservation and in SitU valorization), che mira soprattutto alla realizzazione di un AUV dai costi bassi ma con prestazioni elevate, capace di ricercare, ispezionare, conservare e proteggere il patrimonio archeologico subacqueo.

MDM Team ha curato la progettazione, la realizzazione e il collaudo di Zeno, che si è distinto per le sue elevate performance in termini di manovrabilità e di rapidità nel cambio delle batterie (45 secondi la durata della sostituzione per circa 4 ore di autonomia). L’uso di Zeno non si limita però al campo archeologico, ma può essere esteso alla sicurezza e alla sorveglianza portuale o anche al monitoraggio ambientale. Grazie a Zeno e alla competenza dei suoi professionisti, MDM Team si propone come uno dei principali player nel campo della robotics subacquea.
For years our country has been facing an ageing population, which calls for a reflection on the need for adequate services for increasingly less active groups of citizens. In Peccioli, a village in the province of Pisa, MoBot, a mobile robot that serves as a shopping cart and does not need to be pushed to move, has taken active service. Mediate Srl has created it, a spin-off of the Sant’Anna School of Advanced Studies of Pisa located in Pontedera (PI) which, together with the Municipality of Peccioli and Belvedere Spa company, has studied the needs of citizens by creating this “assistant” on four wheels. MoBot follows the person in their movements, respects their gait and transports what is necessary. MoBot (equipped with an electric motor) can also move independently through the city centre streets avoiding cars and other obstacles, simply activating itself through a smartphone app.

A solution to improve the lives of people like Endoo, a collaborative robotic platform that allows a painless colonoscopy, developed by the company in collaboration with other companies and universities, as part of the European project Endoo. The platform combines a “soft” endoscopic device with an external magnetic guide to overcome the limits of the current technique in terms of invasiveness, and therefore acceptance of the procedure by people.

Da anni il nostro Paese fa i conti con l’invecchiamento della popolazione, che impone una riflessione sulla necessità di servizi adeguati a fasce di cittadini sempre meno attive. A Peccioli, borgo in provincia di Pisa, ha preso servizio effettivo MoBot, robot mobile che funge da carrello della spesa, ma non ha bisogno di essere spinto per muoversi. È opera di Mediate Srl, spin-off della Scuola Superiore Sant’Anna di Pisa con base a Pontedera (PI) che, insieme al Comune di Peccioli e all’azienda Belvedere Spa, ha studiato le esigenze dei cittadini creando questo “aiutante” su quattro ruote. Oltre a seguire la persona nei suoi spostamenti, rispettando la sua andatura e trasportando quanto le è necessario, MoBot (dotato di un motore elettrico) è anche in grado di muoversi autonomamente per le strade del centro evitando auto e altri ostacoli, attivandosi semplicemente attraverso un’app per smartphone.

Una proposta pensata per migliorare la vita delle persone come Endoo, piattaforma robotica collaborativa che consente di eseguire una colonscopia indolore, messa a punto dall’azienda in collaborazione con altre imprese e università, nell’ambito del progetto europeo Endoo. La piattaforma combina un dispositivo endoscopico “morbido” con una guida magnetica esterna per superare i limiti della tecnica attuale, in termini di invasività e quindi accettabilità della procedura da parte delle persone.
Surgical robotics is nothing new. Some hospitals have been using surgical robots for some years now, especially for laparoscopic operations. The challenge is to expand the possibilities and the value of robotics in surgery reaching the microscale and Medical Microinstruments seems to have succeeded. The company, based in Calci (PI), has developed a robotic platform for microsurgery that in 2018 received 20 million euros from a group of investors to complete its development. The platform allows realizing open surgery sutures thanks to articulated micro-instruments.

It is a robot with a wrist-like end that, moving with high precision, replicates the movement of the surgeon on a smaller scale (shrinking it from 5 to 20 times depending on the optical magnification used), avoiding the natural tremors of the human hand. It can be used in plastic and orthopaedic surgical reconstructions, on adult and children, in organ transplantation, oncology and ophthalmology. The MMI team, active since 2015, is led by Giuseppe Prisco, one of the creators of the famous robot DaVinci, the most used for robotic surgery. He turned his experience in the USA into the basis for creating this robot for microsurgery, able to help surgeons achieve better results for hospitals and patients.

La robotica chirurgica non è una novità. Già da qualche anno in alcuni ospedali sono operativi robot chirurgici soprattutto per operazioni laparoscopiche. La sfida è ampliare le possibilità ed il valore della robotica in chirurgia arrivando alla scala micro e Medical Microinstruments sembra esserci riuscita. L’azienda, con sede a Calci (PI), ha infatti messo a punto una piattaforma robotica per microchirurgia che nel 2018 ha ricevuto da un gruppo di investitori 20 milioni di euro utili al completamento del suo sviluppo. La piattaforma consente di realizzare suture in chirurgia a cielo aperto grazie a microstrumenti articolati.

Si tratta un robot con un’estremità simile a un polso che, muovendosi con grande precisione, replica il movimento del chirurgo in scala minore (rimpicciolendolo da 5 a 20 volte a seconda dell’ingrandimento ottico utilizzato), evitando i tremori naturali della mano umana. È utilizzabile per ricostruzioni in chirurgia plastica e ortopedica, in ambito adulto e pediatrico ma anche per il trapianto di organi, in oncologia e oftalmologia. Il team di MMI, attivo dal 2015, è guidato da Giuseppe Prisco, uno degli ideatori del famoso robot DaVinci, il più utilizzato per la chirurgia robotica. Tornato dagli USA, ha fatto della sua esperienza la base per realizzare questo robot per la microchirurgia, in grado di aiutare i chirurghi a ottenere risultati migliori per strutture ospedaliere e pazienti.
Can a physiotherapist evaluate the rehabilitation of a patient based on objective parameters? Today it is possible, thanks to Hunova, the first robotic physiotherapist in the world for orthopaedic, neurological, geriatric and sports rehabilitation. Hunova was created by Movendo Technology, a spin-off company of the Italian Institute of Technology in Genoa and held 50% by Sergio Dompé, owner of the eponymous pharmaceutical company. As a result of the collaboration with the designers of ddp Studio, hunova is easy to use. The robotic seat equipped with sensors, moves in multiple directions, helping the patient during the rehabilitation session.

Hunova offers exercises in the form of interactive games through its screen, and the patient can measure their rehabilitation by exceeding their scores over and over again, turning the recovery process into a leisure activity. The physiotherapist, receives information about the patient and the progress on a tablet, thus being able to advise on activities and evaluating objectively the parameters of the person being treated, not to mention the large amount of data that hunova collects and makes available to the doctor. Moreover, thanks to the easiness of use and the possibility of using pre-established standard protocols, the physiotherapist can follow more patients at the same time.
It seems strange, but even in art, the most creative of human environments, robotics finds a space. NuZoo Robotics knows a little something about it since it creates robots to enliven technological and interactive works of art. NuZoo has worked for Ale Guzzetti, one of the first Italian artists of this genre and the exhibition Realbodies, where the company displayed its humanoid robots and CyberHead, a robotic head developed to move mannequins in stores. The project of the animated shop windows involves the creation of robotic mannequins that can draw the public's attention with movements that induce interaction. NuZoo, as the name suggests, wants to be the place that gathers the new robotic theme.

The company from Vimodrone (MI) was founded in 2011, works in engineering and design for service and entertainment robotics and is on the list of Innovative SMEs. One of its most popular products is Ra.Ro, a robot for environmental surveillance and monitoring. Suitable for both indoor and outdoor spaces, it moves and detects anomalies such as gas leaks or intruders using a thermal camera and transmitting everything in real-time to the control centre. Ra.Ro can be controlled remotely to operate in dangerous contexts, but can also move independently recognizing “signage” along the way.

L'azienda di Vimodrone (MI) nasce nel 2011, si occupa di ingegneria e progettazione per la robotica di servizio e di intrattenimento ed è inserita nell'elenco delle pmi innovative. Uno dei suoi prodotti più conosciuti è Ra.Ro, robot per la sorveglianza e il monitoraggio ambientale. Adatto sia a spazi interni che esterni, si muove rilevando anomalie quali fughe di gas o intrusione di persone utilizzando una telecamera termica e trasmettendo tutto in tempo reale alla centrale di controllo. Ra.Ro può essere controllato da remoto per agire in contesti di pericolo, ma può anche muoversi autonomamente riconoscendo una “segnaletica” disposta lungo il percorso.
What if you go to school not to study robotics but to learn “from” robotics? Valeria Cagnina and Francesco Baldassarre came up with this idea when they founded their OFpassiON, very young (she was born in 2001, he was born in 1992). Everything started - as often happens when it comes to technology, coding, makers - from Arduino, the well-known open source hardware platform: at the age of 11 Valeria met her first Arduino at CoderDojo in Milan, and it was love at first sight. From there came her love for robotics and the invitation to be a speaker at the TEDxMilanoWomen, at the CNR in Pisa, at the Senate of the Republic and at the opening conference of the 2015 Maker Faire Rome.

In 2019, at the age of 18, newly nominated in the “#100UNDER30 that will change Italy” Forbes list, she founded OFpassiON together with Francesco Baldassarre (a computer scientist with a knack for philosophy): an educational robotics company that targets children and young people but also trains team-building in companies such as Cisco, Michelin, Enel, Allianz, IBM and Electrolux. The philosophy behind OFpassiON is that robotics can be a means and not an end, and can be used - through fun and games instead of lectures - to convey soft skills and transversal competences as sought-after as impossible to find: from team working to creative problem solving up to reverse mentoring.

Nel 2019, a 18 anni, fresca della nomina tra i “#100UNDER30 che cambieranno l’Italia” di Forbes, insieme a Francesco Baldassarre (informatico col pallino della filosofia) fonda OFpassiON: azienda di Robotica Educativa che si rivolge a bambini e ragazzi ma che insegna team building anche in realtà come Cisco, Michelin, Enel, Allianz, IBM ed Electrolux. La filosofia che sta dietro OFpassiON è che la robotica possa essere un mezzo e non un fine, e possa essere impiegata – attraverso gioco e divertimento anziché lezioni frontali – per trasmettere soft skill e competenze trasversali tanto richieste quanto introvabili: dal team working al problem solving creativo fino al reverse mentoring.
To move an object with the power of thought: a convenience that would be useful to many, and not just out of laziness. Think of people with disabilities. Being able to move a mechanical device through thought, would contribute to their autonomy by improving the quality of life. The researchers of the Design of Electronic Integrated Systems Laboratory of Polytechnic University of Bari (Scientific Director: Prof. Daniela De Venuto) are working on this, with the project “User-Centred BCI for Mechatronic Actuation by Spatio-Temporal P300 Monitoring”.

The aim is to create a BCI (Brain-Computer Interface), i.e. a communication platform between the human brain and a mechatronic device, be it a wheelchair or a car. The platform is based on the detection of cortical signals picked up by electrodes and sent to artificial intelligence that interprets them and transforms them into commands for the actuation system that makes the machine move. The interpretation of the signals and their implementation must take place in real-time and without errors. The system could be used in assistive technology, in rehabilitation and as a support to autonomous driving. At the moment the system has been developed and tested on a prototype car based on a microcontroller, but with the necessary improvements, it could already be viable for industry.
Politecnico di Milano is one of the three Italian hubs involved in the project “Digital Innovation Hubs in Healthcare Robotics” for the creation of a platform to accelerate the implementation of robotics in the healthcare field. The aim is to connect businesses, health facilities, universities and investors to make robotic products available to health professionals. In the robotic surgery field, at Politecnico, NEARLab (Laboratory of Neuroengineering and Medical Robotics) works on the project “SMARTsurg” to develop a system of robot-assisted laparoscopy through surgical instruments controlled by an exoskeleton and augmented reality to guide the physician within the operating field. Another project is “EDEN2020” for the development of a flexible robotic catheter to release drugs in a controlled way and in situ in case of brain gliomas.

“CerebNEST” is the project launched in 2017 for the creation of a cerebellum model that receives input from sensors and activates a robot. NEARLab is also involved in rehabilitation with the development of upper limb exoskeletons for post-stroke patients and to improve the autonomy of severely disabled patients. Then there is industry; MERLIN Laboratory studies the best man-robot interaction, or how the machine, understanding what the person is doing, can complete their work.

Il Politecnico di Milano è uno dei tre hub italiani coinvolti nel progetto “Digital Innovation Hubs in Healthcare Robotics” per la creazione di una piattaforma che acceleri l’implementazione della robotica nel campo della salute. Lo scopo è collegare imprese, strutture sanitarie, università e investitori per rendere i prodotti robotici disponibili agli operatori sanitari. Nel campo della chirurgia robotica, al Politecnico si lavora presso il NEARLab (Laboratorio di neuroingegneria e robotica medica) al progetto “SMARTsurg”, per sviluppare un sistema di laparoscopia assistita da robot attraverso strumenti chirurgici controllabili da un esoscheletro e realtà aumentata per guidare il medico all’interno del campo operatorio, e al progetto “EDEN2020” per sviluppare un catetererobotico flessibile che rilasci i farmaci in modo controllato e in situ in caso di gliomi cerebrali.

“CerebNEST” è invece il progetto avviato nel 2017 per la creazione di un modello di cervelletto che riceva input dai sensori e faccia muovere un robot. NEARLab si occupa inoltre di riabilitazione con lo sviluppo di esoscheletri per arto superiore per pazienti post-ictus e per migliorare l’autonomia di pazienti gravemente disabili. E poi l’industria: il Laboratorio MERLIN si studia la migliore interazione uomo-robot, ossia come la macchina, comprendendo cosa l’uomo stia facendo, possa completare il suo lavoro.
Knowledge must be shared to grow: only the combination of different and interdisciplinary skills can lead to continuous innovation. For this reason, the PIC4SeR - PoliTO Interdepartmental Centre for Service Robotics - was set up at Politecnico di Torino. This is where the studies on service robotics conducted in five Departments of the Politecnico come together, in particular for their application in precision agriculture, smart cities, emergency management, assistance to people and monitoring of cultural heritage.

Among the ongoing projects is the development of a mobile robotic ground-to-air platform for mapping, monitoring and management of crops, in particular vineyards. Besides, there’s the development of technologies for domestic care services and the study and testing of systems for the inspection of infrastructure in complex, underground and submarine environments. Particular focus is placed on human-machine interaction for safety at work and a positive social, economic and ethical impact. PIC4SeR offers a multidisciplinary approach to the design and use of a new generation of robots and related technologies. Service robotics capable of supporting people in an ever-increasing number of innovative applications.

Per moltiplicarsi, la conoscenza va condivisa: soltanto dalla messa in comune di competenze diverse ed interdisciplinari può nascere innovazione continua. Per questo motivo nasce al Politecnico di Torino il Centro PIC4SeR - PoliTO Interdepartmental Centre for Service Robotics. Qui si riuniscono e trovano sintesi le ricerche sulla robotica di servizio condotte in 5 Dipartimenti del Politecnico, in particolare per applicazioni nell’agricoltura di precisione, nelle smart city, nella gestione delle emergenze, nell’assistenza alle persone e nel monitoraggio del patrimonio culturale.

Tra i progetti in corso c’è lo sviluppo di una piattaforma robotica mobile terra-aria per operazioni di mappatura, monitoraggio e gestione delle coltivazioni, in particolare vigneti. Ma anche lo sviluppo di tecnologie abilitanti per servizi di assistenza domestica e lo studio e sperimentazione di sistemi per l’ispezione di infrastrutture in ambienti complessi, sotterranei e sottomarini. Particolare attenzione è posta all’interazione uomo-macchina per la sicurezza sul lavoro e un positivo impatto sociale, economico ed etico. Il centro PIC4SeR propone un approccio multidisciplinare alla progettazione ed all’impiego di una nuova generazione di robot e delle tecnologie ad essi collegate. Una robotica di servizio in grado di affiancare le persone in un numero sempre crescente di applicazioni innovative.
The human hand is characterized by the presence of the opposable thumb and numerous sensory-motor mechanisms that make it possible to achieve grip types and movements unique in nature. Prensilia studies these mechanisms to realize robotic hands for prosthetics and industry, able to replicate as faithfully as possible the human capabilities. A decade after its foundation as a spin-off of the Sant’Anna School of advanced Studies, the team based in Pontedera (PI) celebrated by introducing Mia, the electric anthropomorphic hand (or, more precisely, the end effector) that, besides being functional, is also beautiful, so much so that in 2019 it won the Red Dot Design Award.

Mia, which has already been experimented in Sweden, has three motors - for the thumb, the index finger and the other three fingers - inserted in the palm, which allow creating different power and precision grips. The sensors in the fingers regulate the pressure, making the gesture natural and giving the user a tactile sensation. The hand, the result of the European DeTOP project for the development of new generation prosthetic technologies, is not the first hand developed by the company. Prensilia has already been awarded in 2009 by the Region of Tuscany for a trans-radial prosthesis project. In 2011 it launched IH2 Azzurra, the first 5-axis anthropomorphic hand with palm integrated systems on the market which is still the least expensive.
“Here robots and hens marry”: this is how Giorgio Bocca defined the original headquarters of Prima Industrie, a shed in the Turin countryside. An ironic image to describe something pioneering, not only for Italy. It was 1977 and a group of technicians from DEA, a mechatronic company, founded a new company for the design of machines for third parties, which today employs 1700 people and has an annual turnover of 400 million. The secret of the company from Collegno (TO) is called laser robot, an automatic laser machine capable of cutting the most varied materials.

After the first few years, the company decided to focus on this technology, producing the first three-dimensional laser cutting machine, becoming the third in the world in this sector. In the beginning, they focused mainly on plastics for the automotive industry, but then came sheet metal and the great success of robots that have made the history of automation. Prima Industrie, listed on the Stock Exchange since 1999, today produces laser machines (with the Divisione Prima Power), electronics (with Prima Electro) and additive manufacturing (with Prima Additive), the most recent arrival in 2018. The robots, which now have 25 axes, cut, bend and drill, collecting data that provides real-time information to improve efficiency and maintenance, from an Industry 4.0 perspective.
The hand, more than any other body part, is the emblem of the human ability to interact with the world by modifying reality. qb SoftHand is an anthropomorphic robotic hand that implements soft-robotics technology, designed and built by qbrobotics, a spin-off company of the University of Pisa (Centro di Ricerca E. Piaggio) and IIT. The motor on the device allows the movement of a tendon, which functions according to the principle of human articulation: the hand is un-sensorized and can adapt the grip to objects of different shapes and sizes thanks to the mechanics.

qb SoftHand is made in several versions depending on the intended use: “Research” is used in the Educational field while “Industry” is designed for intensive industrial applications. The device is compatible and easily integrated with the leading industrial and collaborative robots (co-bots) on the market. Of particular importance is the partnership with Universal Robots, which has made it possible to obtain UR+ certification. qbrobotics operates from its headquarters at Navacchio Technological Pole and, since 2011, has embarked on an internationalisation process that established the company as the world’s leading producer of robotic hands, thanks to a distribution network located on all five continents and capable of reaching thirty countries.

La mano, più di ogni altra parte del corpo, è l’emblema della capacità umana di interagire con il mondo modificando la realtà. qb SoftHand è una mano robotica antropomorfa che implementa la tecnologia della soft-robotics, progettata e realizzata da qbrobotics, azienda spin-off dell’Università di Pisa (Centro di Ricerca E. Piaggio) e dell’IIT. Il motore presente sul dispositivo permette la movimentazione di un tendine, il cui funzionamento è basato sul principio delle articolazioni umane: la mano è de-sensorizzata ed in grado di adattare la presa ad oggetti dalle diverse forme e dimensioni grazie alla meccanica.

qb SoftHand è realizzata in più versioni a seconda della destinazione d’uso: la “Research” è utilizzata in ambito Educational mentre la “Industry” è stata progettata per applicazioni intensive di tipo industriale. Il dispositivo è compatibile e facilmente integrabile con i principali robot industriali e collaborativi (co-bots) presenti sul mercato: di particolare rilevanza la partnership con Universal Robots che ha permesso di ottenere la certificazione UR+. qbrobotics opera dalla propria sede presso il Polo Tecnologico di Navacchio e dal 2011 ha intrapreso un processo di internazionalizzazione che ha portato l’azienda ad essere il primo produttore al mondo di mani robotiche grazie ad una rete distributiva dislocata nei 5 continenti ed in grado di coprire 30 Paesi.
The inhabitants of Peccioli (PI) hold a particular primacy: they were the first in the world to become familiar with an urban robot. The small town hosted the first experimentation with actual users of robots dedicated to waste collection. In 2010 two Dustcarts (this is their name) walked the streets of the centre to collect waste and demonstrate the feasibility of the project. The project was realized by Robotech a spin-off of the Sant’Anna School of advanced Studies of Pisa, founded in 2004 by Nicola Canelli and Cecilia Laschi (a pioneer of soft robotics) to reach the market with innovative robotic solutions.

As I-DROID 01, a robot for children distributed by DeAgostini in a kit to be assembled, to spread knowledge on programming: 100,000 units sold between 2005 and 2011; or Hydronet, an autonomous aquatic vehicle used in a monitoring mission to the island of Giglio around the wreck of Costa Concordia. Thanks to its sensors, Hydronet has collected 150 data relating to the presence of hydrocarbons on the surface and over 250 physical measurements of water (temperature, salinity, pH, etc.). Then there’s Dustclean, a self-driving robot for automatic sweeping of urban and industrial areas, and TSM ARIAMATIC, the first self-driving electric street vacuum cleaner with a system that identifies the operator and follows him step by step during cleaning operations.

Gli abitanti di Peccioli (PI) hanno un primato particolare: sono stati i primi al mondo a familiarizzare con un robot urbano. Il piccolo comune ha ospitato infatti la prima sperimentazione con utenti reali di robot dedicati alla raccolta dei rifiuti. Nel 2010 due Dustcart (questo il loro nome) hanno percorso le vie del centro per raccogliere i rifiuti e dimostrare la fattibilità del progetto. A realizzarlo Robotech, spin-off della Scuola Superiore Sant’Anna di Pisa, fondata nel 2004 da Nicola Canelli e Cecilia Laschi (pioniera della robotica soft) per incontrare il mercato con soluzioni robotiche innovative.

Come I-DROID 01, robot destinato ai ragazzi, distribuito da DeAgostini in un kit da montare, per diffondere la conoscenza della programmazione: 100.000 esemplari venduti tra 2005 e 2011. O Hydronet: veicolo acquatico autonomo utilizzato in una missione di monitoraggio all’isola del Giglio intorno al relitto della nave Costa Concordia. Grazie ai suoi sensori, Hydronet ha rilevato 150 dati relativi alla presenza di idrocarburi in superficie e oltre 250 misure fisiche dell’acqua (temperatura, salinità, pH, ecc.). E ancora Dustclean, robot per lo spazzamento automatico di aree urbane e industriali a guida autonoma e TSM ARIAMATIC, primo aspiratore stradale elettrico a guida autonoma con sistema che identifica l’operatore e lo segue passo passo nelle operazioni di pulizia.
Thanks to the almost thirty-year partnership with Panasonic Welding System, Roboteco has progressively established itself in the demanding and competitive automotive and general industry sectors, specialising in the promotion and integration in its plants of Panasonic Tawers technology, a revolutionary model that involves the complete fusion of robot and welding machine. After celebrating its 30th anniversary in 2018, Roboteco Italargon received the silver medal from the Japanese giant as a world-class partner and the gold medal for Europe.

The company has three operating sites, Limito di Pioltello (MI), Curno (BG) and has just inaugurated a new and larger plant in Genoa Bolzaneto. Fifty employees and over 3000 robots installed in various countries around the world are the business card of Roboteco Italargon. Panasonic welding robots leave the mother factory with a standard configuration; the company’s task is to make them compliant with customers’ specifications, allowing them to carry out operations that are at times unique. Its robotic welding lines, especially in the automotive sector, will also characterise the production of the new electric Fiat Cinquecento; the company is producing robots for underbody welding components equipped with innovative technology for welding aluminium.

Grazie alla partnership quasi trentennale con Panasonic Welding System, Roboteco si è affermata progressivamente negli esigenti e competitivi settori dell’automotive e della general industry, specializzandosi nella promozione e integrazione nei propri impianti della tecnologia Panasonic Tawers, un modello rivoluzionario che prevede la fusione completa tra robot e saldatrice. Roboteco Italargon, dopo aver festeggiato nel 2018 i suoi 30 anni, ha ricevuto dal colosso giapponese la medaglia di d’argento come partner d’eccellenza mondiale e quella d’oro per l’ambito europeo.

L’azienda ha tre sedi operative, Limito di Pioltello (MI); Curno (BG) e ha appena inaugurato un nuovo e più grande stabilimento a Genova Bolzaneto. 50 addetti e oltre 3000 robot installati in vari Paesi del mondo sono il biglietto da visita di Roboteco Italargon. I robot di saldatura Panasonic escono dalla fabbrica madre con una configurazione standard; compito dell’azienda è renderli conformi alle specifiche dei clienti, consentendo loro di effettuare operazioni a volte uniche. Le sue linee di saldatura robotizzate, soprattutto in ambito automotive, caratterizzeranno anche la produzione della nuova Fiat Cinquecento elettrica: l’azienda sta infatti realizzando i robot per la saldatura di componenti sotto scocca, dotati di una tecnologia innovativa per la saldatura dell’alluminio.
In the beginning, there was Scienzia Machinale, the first spin-off company of the Sant’Anna School of Advanced Studies of Pisa founded in 1991 by young robotics researchers. A few years later Fabrica Machinale was born, and in 2011 the brand Roboticom was created, now part of an Italian-American group. The roots remain in Pisa, but its advanced robotic applications are everywhere. From ScultoRob for artistic milling of marble and light materials to SandRob, the first 7-axis robotic system for surface finishing on complex shapes, able to automatize operations that until now were carried out manually such as sanding, polishing, cutting and gluing of composite materials, plastic or metal.

With SandRob, the production process is entirely controlled, guaranteeing a high and constant quality of the results. The system is part of the Dallara Automobili production process, which uses it as a multifunctional system for finishing its carbon chassis and in 2018 was awarded the Robotic Innovation Award at Mecspe, the leading trade fair for the manufacturing industry. The core of the technology is the ARPP software that combines all the functions necessary for programming the robot in a single application. With SandRob productivity increases by 70% and the working environment improves, in terms of safety and workers’ health.

In principio fu Scienzia Machinale, la prima azienda spin-off della Scuola Superiore Sant’Anna di Pisa fondata nel 1991 da giovani ricercatori di robotica. Qualche anno dopo nasce Fabrica Machinale e nel 2011 viene creato il brand Roboticom, oggi parte di un gruppo italo-americano. Le radici sono rimaste nel pisano, ma le sue applicazioni robotiche avanzate sono ovunque. A partire da ScultoRob per fresatura artistica di marmo e materiali leggeri, per arrivare a SandRob, il primo sistema robotico a 7 assi per la finitura superficiale su forme complesse, in grado di automatizzare operazioni finora svolte manualmente come carteggiatura, lucidatura, taglio ed incollaggio di materiali compositi, plastica o metallo.

Con SandRob il processo produttivo viene interamente controllato, garantendo una qualità elevata e costante dei risultati. Inserito all’interno del processo produttivo di Dallara Automobili, che lo utilizza come sistema multifunzione per la finitura dei suoi telai in carbonio, nel 2018 il sistema ha ricevuto il Premio Innovazione Robotica nell’ambito di Mecspe, la fiera di riferimento per l’industria manifatturiera. Fulcro della tecnologia è il software ARPP che integra in un’unica applicazione tutte le funzionalità necessarie per la programmazione del robot. Con SandRob la produttività aumenta del 70% e migliorano gli ambienti di lavoro, in termini di sicurezza e salute degli addetti.
When one of China’s largest robot manufacturers invests in a company, it means that the company has the expertise that makes it a crucial partner. Like Robox, from Castelletto Sopra Ticino (NO), which has been producing motion control equipment since 1975 and recently welcomed Efort Intelligent Equipment, among the top 3 manufacturers of anthropomorphic robots in the Chinese market. Robox manufactures the components that allow robots and machine tools to perform programmed movements, whatever the number of axes that compose them. These control units, a sort of brain, can be used on industrial robots for welding, cutting, painting, palletizing, pick&place machines for different materials, automatic guided trolleys (AGV) and more. Everything can be moved to work together in tandem with drives and brushless motors, systems that convert electrical energy into mechanical energy.

Robox designs the hardware, develops the necessary operating systems, programming languages and software. The flagship product is RP-2, a Programmable Automation Controller (PAC), which is a control unit with great potential and wide connectivity thanks to various EtherNet ports and wi-fi connection that makes it manageable from any mobile device, without the need for an operator interface: a major player in the 4.0 industry.

Robox progetta l’hardware, sviluppa i sistemi operativi, i linguaggi di programmazione e i software necessari. Prodotto di punta è RP-2, un Programmable Automation Controller (PAC), ossia un’unità di controllo con grandi potenzialità e un’ampia connettività grazie a varie porte EtherNet e al collegamento wi-fi che lo rende controllabile da qualsiasi device mobile, senza necessità di un’interfaccia operatore: un primo attore dell’industria 4.0.
Anthropomorphic robots are increasingly present in the production plants, offering excellent performance but limited to the range of their arm. Rollon's know-how, gained in over 40 years of experience in the field of linear motion, has enabled the company based in Vimercate (MB) to develop systems dedicated to robot handling; the “Seventh Axis” family. It is a series of seven shuttle systems for moving anthropomorphic robots up to 2,000 kg for long distances and with high dynamics. The Rollon solution can be integrated with any robot and can be configured for use on the ground, on the wall or the ceiling. It is made up of anodized aluminium profiles and offers significant advantages in terms of weight, portability and modularity.

The provided solutions, designed to handle different types of robots, are available in three protective versions to operate in the most challenging environments and have adjustable feet to handle misalignment on uneven surfaces. Founded in 1975, Rollon is a global reference point for linear motion solutions, with production plants in Italy, Germany and the United States, and foreign branches in France, China, India and Japan. The turnover of 2018 amounts to 112 million euros, and in the same year, the company was acquired by the US group The Timken Company.

All’interno degli stabilimenti produttivi sono sempre più presenti i robot antropomorfi, che offrono performance eccellenti ma limitate al raggio d’azione definito dal proprio braccio. Il know-how di Rollon, maturato in oltre 40 anni di esperienza nel campo del moto lineare, ha permesso all’azienda con sede a Vimercate (MB) di realizzare dei sistemi dedicati alla movimentazione dei robot: la famiglia “Seventh Axis”. Si tratta di una gamma di 7 sistemi a navetta per muovere robot antropomorfi fino a 2,000 kg per lunghe distanze e con dinamiche elevate. Integrabile con ogni tipo di robot, la soluzione Rollon – configurabile per un utilizzo a terra, a parete o a soffitto – è composta da profili in alluminio anodizzato e offre grandi vantaggi in termini di peso, trasportabilità e modularità.

Le soluzioni proposte, atte a movimentare differenti tipi di robot, sono disponibili in tre versioni di protezione per operare anche negli ambienti più difficili e hanno piedini regolabili per gestire il disallineamento su superfici irregolari. Fondata nel 1975, Rollon è punto di riferimento a livello globale in soluzioni per la movimentazione lineare, con siti produttivi in Italia, Germania e Stati Uniti, filiali estere in Francia, Cina, India, Giappone. Il fatturato 2018 ammonta a 112 milioni di euro e nello stesso anno l’azienda è stata acquisita dal gruppo statunitense The Timken Company.
They run a ball, kick and score. In July 2019 they were in Sydney to compete in their world championship, but they are not football stars: they are humanoid robots programmed by the SPQR team, made up of students from the Department of computer, automation and management engineering of the Sapienza University of Rome. Sapienza is the only Italian University to have a master’s degree in Artificial Intelligence and Robotics. Since 1998, the team has participated in the RoboCup World Championship, one of the most important international competitions in which robots compete on the football field. The aim is to organize a match between human and robot world champions in 2050.

In the meantime, research is being carried out to make the robots more precise, coordinated and autonomous. The work behind this project involves the University on various levels, from mapping challenging environments with robots capable of exploring and creating a virtual guide to the Priscilla catacombs in Rome (ROVINA 2016 project), to precision agriculture with a combined system of ground and air vehicles to support field management (Flourish 2018 project). Currently, solutions are being studied for man-robot collaboration in industrial polishing (SYMPLEXITY project), and the University is involved in the European project AI4EU. 79 partners from 21 countries will create a pole for artificial intelligence with the task of developing the next lines of research in the field.
The word robot comes from a Czech word meaning “heavy work”; the purpose of these machines is to relieve man from tiresome operations. Scaglia INDEVA industrial manipulators are real human arm extensors that, in addition to favouring work ergonomics, meet the needs of the 4.0 industry. Founded in 1838 by Martino Scaglia for the production of spools for the textile industry, the Scaglia Group is structured into five companies (one thousand employees and seven branches in Europe, America, Asia) including Scaglia INDEVA. Founded in 2004, the company has inherited an experience in automation that dates back to 1975, when the first Liftronic was created, a balancer for the moving and positioning of loads.

The company, based in Val Brembilla (BG), produces intelligent manipulators, INtelligent DEVices for hAndling (INDEVA) for major automotive, food and manufacturing brands. INDEVA allow to lift, rotate and reposition heavy items effortlessly. Liftronic electronic manipulators do not require any pre-setting of the weight but automatically balance it, detecting it in real-time, without interrupting the work if the weight changes during movement. INDEVA apply the necessary force by moving precisely and following the operator’s gestures. Equipped with a self-diagnostic system, they receive remote assistance thanks to the Indeva App.

La parola robot deriva da una parola ceca che significa “lavoro pesante”; lo scopo di queste macchine è sollevare l’uomo dalle operazioni faticose. I manipolatori industriali Scaglia INDEVA sono dei veri e propri estensori del braccio umano che, oltre a favorire l’ergonomia del lavoro, rispondono alle esigenze dell’industria 4.0. Fondato nel 1838 da Martino Scaglia per la produzione di rocchetti per l’industria tessile, il Gruppo Scaglia è strutturato in 5 aziende (1000 dipendenti e 7 filiali in Europa, America, Asia) tra cui Scaglia INDEVA. Nata nel 2004, eredita un’esperienza nell’automazione che risale al 1975, quando fu realizzato il primo Liftronic, un bilanciatore per la movimentazione e il posizionamento di carichi.

L’azienda di Val Brembilla (BG) realizza per grandi marchi dell’automotive, del food e del manifatturiero manipolatori intelligenti, INtelligent DEVices for hAndling (INDEVA) che consentono di sollevare, ruotare e riposizionare oggetti pesanti senza sforzo. I manipolatori elettronici Liftronic non richiedono di preimpostare il peso ma lo bilanciano automaticamente, rilevandolo di continuo in tempo reale, evitando di interrompere il lavoro se il peso cambia durante lo spostamento. Applicano la forza necessaria muovendosi in modo preciso e assecondando i gesti dell’operatore. Dotati di sistema di auto-diagnosi, ricevono assistenza da remoto grazie alla App-Indeva.
In 2019 it organized the Robotics Olympics, a competition between high school students who challenge each other with ideas for solving actual problems with the use of robots, and every year it promotes the NAO Challenge, dedicated to humanoid robotics. The Scuola di Robotica has earned a prominent place in the training field by working on expanding the knowledge of robotics. The association has been a reference point for training since 2000 when a group of robotics and human sciences experts founded the School. In 2004 Scuola di Robotica organized the First International Symposium on Roboetica, creating a line of research and discussion on ethical issues related to the use of robots and artificial intelligence.

The School provides training for teachers (it is, in fact, a training institution certified by MIUR) with courses for the use of robotics in teaching. In addition, it organizes events to bring young people closer to robotics. Scuola di Robotica is currently involved in the European project EarlyCode, aimed at creating a university course for future kindergarten teachers who want to specialize in methodologies for the development of children’s computational thinking. The School will propose the best strategies for teaching robotics to children.

Nel 2019 ha organizzato le Olimpiadi di Robotica, competizione tra studenti delle scuole superiori che si sfidano a colpi di idee per la risoluzione di problemi reali con l’utilizzo di robot e ogni anno promuove la NAO Challenge, dedicata alla robotica umanoide. La Scuola di Robotica ha saputo guadagnarsi un posto di rilievo nel panorama della formazione lavorando sulla promozione della conoscenza della robotica. Sin dal 2000, anno in cui un gruppo di robotici ed esperti di scienze umane decisero di fondare la Scuola, l’associazione è stata un punto di riferimento per la formazione, tanto che nel 2004 fu proprio la Scuola a organizzare il Primo Simposio Internazionale sulla Roboetica, dando vita a un filone di ricerche e riflessioni sui temi etici legati all’uso dei robot e dell’intelligenza artificiale.

La Scuola, oltre ad organizzare eventi per avvicinare i più giovani alla robotica, si occupa della formazione dei docenti (è infatti un ente formatore certificato dal MIUR) con corsi per l’utilizzo della robotica nella didattica. Attualmente è impegnata nel progetto europeo EarlyCode, volto alla creazione di un corso universitario per futuri insegnanti di scuola dell’infanzia che vogliono specializzarsi in metodologie utili allo sviluppo del pensiero computazionale dei bambini. La Scuola dovrà proporre le migliori strategie di insegnamento della robotica ai più piccoli.
When it comes to excellence, it is all about the Sant’Anna School of Advanced Studies of Pisa. In particular, the Institute of BioRobotics and the TeCIP Institute are hotbeds of innovation that become products through the creation of spin-offs. Robotics for human health and well-being: researchers are inspired by nature to create collaborative, rehabilitative, wearable and implantable machines. The BioRobotica laboratories, developed soft robotics which for the first time focused on elastic and soft materials to create robots such as PoseiDRONE, a four-armed octopus robot for exploring the seas. Others are I-SUPPORT, a “soft” robotic arm that helps people with reduced mobility in personal hygiene; or Hybrid Heart, a project for the creation of an artificial robotic heart.

Among the many research fields, the TeCIP Institute works on perceptive robotics, developing devices to cooperate with the man intuitively and safely, also exploiting virtual and augmented reality. Moreover, Wearable haptic devices are developed: they allow to “feel” and manipulate virtual objects, and exoskeletons with force feedback that can assist man in the handling of loads or for rehabilitation. In this sector, the RONDA project has created a gym equipped with wearable robots for physiotherapy.

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In robotics, Italy undeniably boasts top-level skills. In 1975, when robotics began to be discussed in the United States and the first machines appeared around the world, SIRI, the Società Italiana per la Robotica Industriale, now Associazione Italiana di Robotica e Automazione, was founded in Ivrea (TO). Conceived by Olivetti’s engineer Antonio D’Auria, its first president, SIRI was the second association dedicated to robotic machine manufacturers in the world, after the first in Japan. The International Federation of Robotics (IFR), worldwide, arrived only 12 years later. Its aim, now as then, is to bring together manufacturers, distributors, builders and universities to represent them and encourage dialogue between the academic world and industry.

Through events, initiatives and training courses, SIRI supports the world of robotics by addressing the latest issues and tackling misinformation. The collaboration with UCIMU-SISTEMI PER PRODURRE (Associazione Costruttori Italiani Macchine Utensili, Robot e Automazione) allows it to always keep an eye on the needs, requests and opinions of the industry. The 40th anniversary celebrated in 2015 was an important moment to take stock and reaffirm its role of reference and guidance for this ever-evolving sector.

Nella robotica l’Italia vanta indubbiamente competenze di primo livello. Nel 1975, quando di robotica si iniziava a parlare negli Stati Uniti e qualche prima macchina compariva in giro per il mondo, a Ivrea (TO) nasceva SIRI, Società Italiana per la Robotica Industriale, oggi Associazione Italiana di Robotica e Automazione. Ideata dall’ingegner Antonio D’Auria di Olivetti – che ne fu il primo presidente – fu la seconda associazione dedicata ai produttori di macchine robotiche al mondo, dopo quella giapponese. L’international Federation of Robotics (IFR), a livello mondiale, arrivò solo 12 anni più tardi. Il suo scopo, allora come oggi, è riunire produttori, distributori, integratori e università per dar loro rappresentanza e favorire il dialogo tra mondo accademico e industria.

Attraverso eventi, iniziative e corsi di formazione lavora per sostenere il mondo della robotica affrontando i temi più attuali e combattendo la cattiva informazione. La collaborazione con UCIMU-SISTEMI PER PRODURRE (Associazione Costruttori Italiani Macchine Utensili, Robot e Automazione) le consente di avere sempre il polso delle necessità, richieste, opinioni dell’industria. Il 40° anniversario celebrato nel 2015 ha costituito un momento importante per fare il punto e ribadire il suo ruolo di riferimento e di accompagnamento per questo settore in continua evoluzione.
Men and robots must be able to share the same space and understand each other, to work together. However, if men can perceive what is happening around them, the same cannot be said of robots. Smart Robots has developed an innovative, collaborative robotics solution where robots and humans interact in a harmonic way working together within the same space. Born from the collaboration with the Politecnico di Milano, Smart Robots is now an E-Novia group company, the Enterprises Factory that in recent years has created 27 innovative companies by promoting the international intellectual property of Italian universities.

Smart Robots is equipped with technologies of environmental perception and, like an eye, analyzes the scenario, tracking the actions and gestures of the operator and the most important objects within the collaboration area. Through a 3D vision sensor and artificial intelligence algorithms, Smart Robots “sees” the operator and reports any deviations from the sequence of simple operations, sends commands back to the robot to act safely in parallelizing the most repetitive tasks and learns new operational sequences from the operator. Smart Robots helps people to work smarter and safer.

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Per lavorare insieme, uomini e robot devono poter condividere lo stesso spazio e comprendersi a vicenda. Ma se l’uomo è in grado di percepire cosa accade intorno a sé, lo stesso non si può dire per i robot. Smart Robots ha sviluppato un’innovativa soluzione di robotica collaborativa dove robot e umani interagiscono in modo armonico lavorando insieme all’interno di uno stesso spazio. Nata dalla collaborazione con il Politecnico di Milano, Smart Robots è ora una società all’interno del gruppo E-Novia, la Fabbrica di Imprese, realtà che negli ultimi anni ha dato vita a 27 imprese innovative valorizzando a livello internazionale la proprietà intellettuale degli atenei italiani.
The crowdfunding campaign on Kickstarter allowed them to raise over $1 million in just over a month, for a project that revolutionizes the processing of flat surfaces, affordable to all manufacturers and business professionals. Lorenzo Frangi, Alessandro Trifoni and Davide Cevoli, are the founders of Springa, a spin-off of the Politecnico di Milano, and inventors of Goliath CNC, a CNC machine for limitless cutting and milling. Until now, desktop milling machines have only allowed working on small parts, while large objects required a bulky and expensive industrial machine.

Goliath CNC is a small robot that, by positioning itself directly on the workpiece, has an unlimited working area, is portable and autonomous. The user can send the project file to Goliath CNC and follow their work from the PC. Its accuracy reaches a tenth of a millimetre, and the patented sensor system allows it to position itself in the space and to correct any errors. It weighs about 15 kg so that it can be moved easily and the three wheels guarantee stability and mobility in any direction. The adventure of this young team began in 2014 but the startup, incubated in PoliHub, was founded two years later.

La campagna di crowdfunding su Kickstarter ha consentito loro di raccogliere oltre 1 milione di dollari in poco più di un mese, con un progetto che rivoluziona la lavorazione delle superfici piane, a portata di tutti i maker e professionisti. Loro sono Lorenzo Frangi, Alessandro Trifoni e Davide Cevoli, fondatori di Springa, spin-off del Politecnico di Milano, e inventori di Goliath CNC, macchina a controllo numerico per il taglio e la fresatura senza limiti. Finora le fresatrici desktop consentivano di operare soltanto su piccoli pezzi, mentre per oggetti di grandi dimensioni era necessaria una macchina industriale, ingombrante e costosa.

Goliath CNC è un piccolo robot che, posizionandosi direttamente sul pezzo da lavorare, ha un’area di lavoro illimitata, è portatile e autonomo. L'utente può inviare il file di progetto a Goliath CNC e seguire il suo lavoro da PC. La sua precisione arriva dal decimo di millimetro e il sistema brevettato di sensori gli permette di posizionarsi nello spazio correggendo eventuali errori. Pesa circa 15 kg, quindi può essere spostato facilmente e le tre ruote garantiscono stabilità e movimento in qualsiasi direzione. L’avventura di questo giovane team inizia nel 2014 ma la fondazione della startup, incubata in PoliHub, è di due anni dopo.
Robots come in many different shapes, but all of them are equipped with sensors, components that allow them to interact with the real world; in other words, their senses. STMicroelectronics, a leading company in the development of semiconductors, with revenues of $9.66 billion, 46,000 employees worldwide and more than 100,000 customers, has been committed for years to the development of sensors for various applications, from autonomous vehicles to drones, wearable devices and robotics. In 2017, the company introduced the third generation of laser sensors for distance measurement based on its proprietary FlightSense technology. Here, optical lenses have been added to the silica, improving detection performance and allowing devices to detect multiple objects at the same time. Detection comes from measuring the speed at which the light emitted goes back by reflection.

This is a major advancement in robotics sensor technology; in less than 5 mm the sensor can manage all its functions without “weighing down” the work of the central processor, reducing power consumption and increasing battery life. In 2018 IIS3DHHC was launched, an acceleration detection sensor (accelerometer), particularly suitable for detecting small movements. The peculiarity of this sensor is to reduce the error to a minimum, with an extremely high resolution.

I robot possono avere molte forme ma tutti sono dotati di sensori, componenti che consentono loro di rapportarsi con il mondo reale, di fatto i loro sensi. STMicroelectronics, azienda leader nello sviluppo di semiconduttori, con 9,66 miliardi di dollari di ricavi, 46 mila addetti nel mondo, più di 100 mila clienti, da anni è impegnata nello sviluppo di sensoristica per varie applicazioni, dai veicoli autonomi ai droni fino ai dispositivi indossabili e alla robotica. Nel 2017 ha presentato la terza generazione di sensori laser per misurare la distanza basati su una tecnologia proprietaria FlightSense. Qui, al silicio, ha aggiunto delle lenti ottiche, migliorando le performance del rilevamento – la percezione deriva dalla misura della velocità con cui la luce emessa torna indietro per riflessione – e consentendo ai dispositivi di rilevare più oggetti nello stesso momento.

Si tratta di un notevole avanzamento della sensoristica per la robotica: in meno di 5 mm il sensore è in grado di gestire tutte le sue funzioni senza “appesantire” il lavoro del processore centrale, riducendo i consumi e aumentando la durata delle batterie. Nel 2018 è stato lanciato IIS3DHHC, un sensore di rilevamento dell’accelerazione (accelerometro), adatto in particolare a rilevare i più piccoli movimenti. La peculiarità di questo sensore è di ridurre al minimo l’errore, presentando una risoluzione estremamente elevata.
Who said that studying is boring? If robotics comes into play, everything becomes a lot more fun. In Milan, within MIND – Milano Innovation District (Ex Area Expo 2015), in the Social Innovation Academy of Fondazione Triulza, there is a place where you can learn with robots. That’s Stripes Digitus Lab, an international research centre on educational robotics and digital technologies created by Stripes Cooperativa Sociale, a reality that carries out research, training, design and management of educational services. The Cooperative was founded in 1989 when some training professionals decided to join forces and share their experiences at the service of people. Today the Cooperative has 630 operators involved in more than 50 activities.

Stripes Digitus Lab is a place designed for children and pre-teens - the generation of digital natives - which, in collaboration with other local realities, organizes activities to introduce young people to robotics and programming by learning how a robot works and is programmed. Teachers and parents also have their own space here, as they get involved in educational initiatives with a view to exchange and inclusiveness. The Research Centre, led by the Scientific Director Igor Guida, cooperates with several realities, among which: Università Cattolica and University of Milano - Bicocca, CREMIT, CNR, Ecole Polytechnique Federale de Losanne, Mobsya and Poppy Station.

Chi ha detto che studiare sia noioso? Se entra in gioco la robotica, tutto diventa più divertente. A Milano, all’interno di MIND – Milano Innovation District (Ex Area Expo 2015), nella Social Innovation Academy di Fondazione Triulza, c’è un luogo dove si impara con i robot. È lo Stripes Digitus Lab, Centro internazionale di ricerca sulla robotica educativa e le tecnologie digitali creato da Stripes Cooperativa Sociale, realtà che svolge attività di ricerca, formazione, progettazione e gestione di servizi educativi. La Cooperativa prende vita nel 1989 quando alcuni professionisti della formazione decidono di unirsi per mettere in comune le proprie esperienze a servizio delle persone e oggi conta 630 operatori impegnati in più di 50 servizi.

Lo Stripes Digitus Lab è un luogo pensato per bambini e preadolescenti – la generazione dei nativi digitali – che, in collaborazione con altre realtà del territorio, organizza attività per avvicinare i ragazzi alla robotica e alla programmazione imparando come funziona e si programma un robot. Qui anche insegnanti e genitori hanno il loro spazio, coinvolti nelle iniziative didattiche in un’ottica di scambio e inclusività. Il Centro di ricerca, guidato dal Direttore Scientifico Igor Guida, collabora con diverse realtà, tra cui: Università Cattolica e Università Bicocca di Milano, CREMIT, CNR, Ecole Polytechnique Federale de Losanne, Mobsya e Poppy Station.
Every year in Las Vegas, the biggest international hi-tech fair takes place, gathering the best technologies for electronics. At the 2019 International Consumer Electronics Show (CES), representing Italy among the best startups, there were also Riccardo Tornese and Nicola Croce, two of the founders of TactileRobots. The team, from Lecce, presented TR1, the service robot designed for transporting small packages in places such as restaurants, hotels and hospitals. It looks like a trolley but is made of materials that are soft and touch-sensitive. It can, therefore, move safely in confined spaces and the presence of people. In addition to avoiding obstacles and stopping in the event of an imminent collision, TR1 can resume its journey even when it is moved manually, because it may be occupying space.

The robotic trolley has a space inside that can contain, for example, a food tray that is opened and closed with a tap. Once the route is programmed, TR1 independently takes its load to destination, be it a hotel room or a hospital bed. The prototype was created using regional funds, and now plans are made for the future with a patent application and the launch of projects to develop a variant of TR1 suitable for luggage transport.

Ogni anno a Las Vegas si svolge la più grande fiera internazionale dell’hi-tech che raduna le migliori tecnologie per l’elettronica. All’International Consumer Electronics Show (CES) 2019, a rappresentare l’Italia tra le migliori startup, c’erano anche Riccardo Tornese e Nicola Croce, due dei fondatori di TactileRobots. Il team, partito da Lecce, ha presentato al mondo TR1, il robot di servizio pensato per il trasporto di piccoli colli in luoghi quali ristoranti, hotel e ospedali. Ha l’aspetto di un carrello ma è realizzato in materiali morbidi al tatto e sensibili al tocco. Ciò gli consente di muoversi in sicurezza in spazi ristretti e in presenza di persone. Oltre a evitare gli ostacoli e a fermarsi in caso di imminente collisione, TR1 è in grado di riprendere il proprio cammino anche quando viene spostato manualmente, magari perché sta ingombrando uno spazio.

Il carrello robotico presenta uno spazio vuoto all’interno che può ospitare, ad esempio, un vassoio con vivande e che viene aperto e chiuso con un tocc. Programmat o il percorso, TR1 porta autonomamente il suo carico a destinazione, che si tratti di una camera d’albergo o di un letto di ospedale. Realizzato il prototipo grazie a fondi regionali, ora si pensa al futuro con una domanda di brevetto e l’avvio di progetti per realizzare una variante di TR1 adatta al trasporto bagagli.
Industrial automation can be highly complex and varied: welding, handling, assembly, painting, palletizing, packaging. Maybe we don’t even realize it, but behind any product, there is a long series of operations, each one requiring particular tools and procedures. Tiesse Robot has the ideal solution for each. Its plant, opened in 1976 by Luigi Daprà and Alfredo Gavazzi, has been located in Visano (BS) for over 40 years and deals with industrial automation. In the ‘80s the company entered the world of robotics that was a driving force for the future and in 1992 signed a deal with Kawasaki, which acquired 24.9% of the company and became a strategic partner.

Much more than a distributor of Japanese robots, Tiesse Robot studies custom turnkey solutions for industrial plants, also developing vision systems for Kawasaki robots. During the SPS IPC Drives exhibition held in Parma in 2019, the company presented a robotized area created in collaboration with Smart Robots, a spin-off of the Politecnico di Milano, characterized by a two-arm Kawasaki Duaro cobot connected to a three-dimensional vision system that “understands” the movements of the operator by adapting to it, useful for assembly, testing or inspection operations of components weighing up to 2 kg.

L’automazione industriale può essere qualcosa di molto complesso e variegato: saldatura, manipolazione, assemblaggio, verniciatura, palletizzazione, packaging. Forse neanche ce ne accorgiamo, ma dietro di ogni prodotto c’è una lunga serie di operazioni, ognuna delle quali necessita di strumenti e procedure particolari. Tiesse Robot ha la soluzione per tutte e per ciascuno l’impianto ideale. Il suo stabilimento aperto nel 1976 da Luigi Daprà e Alfredo Gavazzi, da oltre 40 anni ha sede a Visano (BS) e si occupa di automazione industriale. Negli anni ’80 l’ingresso nel mondo della robotica che si preannunciava un volano per il futuro e nel 1992 l’accordo con Kawasaki, che acquisisce circa il 24,9% dell’azienda e ne diventa partner strategico.

Molto più che un distributore dei robot giapponesi, Tiesse Robot studia soluzioni personalizzate turn key per gli impianti industriali, sviluppando anche sistemi di visione per i robot Kawasaki. Durante la fiera SPS IPC Drives tenutasi a Parma nel 2019, l’azienda ha presentato un’isola robotizzata realizzata in collaborazione con Smart Robots, spin-off del Politecnico di Milano, caratterizzata da un cobot Kawasaki Duaro a due bracci collegato a un sistema di visione tridimensionale che “capisce” i movimenti dell’operatore adattandovisi, utile per operazioni di assemblaggio, test o ispezione di parti fino a 2 kg di peso.
In 2018 the Italian production of robotic and automation machine tools, an important sector of the Italian manufacturing industry, generated a revenue of 6.8 billion euros. UCIMU-SISTEMI PER PRODURRE, the Italian association of manufacturers of machine tools, robots and automation to which FONDAZIONE UCIMU is linked, represents the interests of this industry. Its 220 member companies represent more than 70% of the Made in Italy sector required for the creation of everyday objects. In this sector, the impact of Industry 4.0 has been considerable because the revolution of robotics starts on the production machinery.

UCIMU, within the Confindustria System, voices this world by dealing with the legislative, certification, quality and innovation aspects, providing member companies with the information tools necessary to protect their own production. The association represents the Made in Italy sector in the world, giving visibility to its members and introducing institutions to the interests of the industry. UCIMU supports companies in their activities, from research and economic analysis to marketing, also promoting exhibitions such as 32.BI-MU, a biennial of machine tools, robots and automation; Lamiera, dedicated to plants for sheet metal working; and EMO MILANO, the world’s industry trade show that will be held in 2021.

UCIMU, all’interno del Sistema Confindustria, dà voce a questo mondo occupandosi degli aspetti legislativi, di certificazione, qualità e innovazione fornendo alle aziende associate gli strumenti informativi necessari per la tutela delle proprie produzioni. L’associazione rappresenta nel mondo il made in Italy di settore, dando visibilità ai propri associati e presentando alle istituzioni gli interessi del comparto. Affianca le imprese nelle loro attività, dalla ricerca e analisi economica, al marketing, promuovendo anche l’organizzazione di fiere quali 32.BI-MU, biennale delle macchine utensili, dei robot e dell’automazione, Lamiera, dedicata agli impianti per la lavorazione di lamiere, e EMO MILANO, la mondiale di settore che terrà la prossima edizione nel 2021.
To take care of the person beyond the disease is one of the objectives of Rome Biomedical Campus University since its foundation in 1993. The Advanced Robotics and Person-Centred Technologies Unit (CREO Lab) carries out advanced research in the fields of biorobotics, biomechatronics, neuroengineering and neurorobotics through the design, development and validation of robotic and mechatronic systems for biomedical applications (rehabilitation, care, surgery, bionics). The European project AIDE aims at improving human-machine interfaces in the field of rehabilitation and care technologies for people with disabilities.

The concept of “biocooperative robotic system” was created by AIDE and, in the BRiC/RehabRobo@Work project, is applied to the robot-mediated rehabilitation treatment of people suffering from musculoskeletal occupational illnesses. The Sensibilia project is dedicated to upper-limb bionics, in collaboration with the Inail Prosthesis Centre in Vigoros di Budrio (BO), with the aim of re-establishing bi-directional communication with the nervous system and tactile sensitivity in people with upper-limb amputation. Sensibilia has opened up new scenarios in upper limb bionics, as in the ANIA project on the development of prostheses for macro-injured patients with amputations due to road accidents.

Da AIDE nasce il concetto di “sistema robotico biocooperativo” che, nel progetto BRiC/RehabRobo@Work, trova applicazione nel trattamento riabilitativo robot-mediato di persone affette da patologie professionali di tipo muscolo-scheletrico. Alla bionica diarto superiore è dedicato il progetto Sensibilia realizzato in collaborazione con il Centro Protesi Inail di Vigoros di Budrio (BO), finalizzato a ristabilire la comunicazione bidirezionale con il sistema nervoso e la sensibilità tattile nelle persone con amputazione diarto superiore. Sensibilia ha schiuso nuovi scenari nella bionica diarto superiore, come sta avvenendo nel progetto ANIA sullo sviluppo di protesi per pazienti macrolesi con amputazione a causa di incidente stradale.
UAVs (Unmanned Aerial Vehicles), better known as "drones", are one of the most widespread technologies of recent times, but the potential of these tools is still growing and is the subject of authoritative studies. Like those carried out in the AREA laboratory (Automation, Robotics and Applied Electromagnetism), an essential resource of the University of Basilicata. There, the team led by Prof. Fabrizio Caccavale studies the UAVs, correlating them with the other main research line of the laboratory, robotic manipulation.

The laboratory also works in collaboration with the Consortium C.R.E.A.T.E. (Consorzio di Ricerca per l’Energia, l’Automazione e le Tecnologie dell’Elettromagnetismo), a reality that unites the university world with the world of business to accelerate technological development. The AREA laboratory, through the Consortium, is active in the European project AEROARMS and is working on the creation of the first airborne robotic system with multiple mechanical arms and advanced handling capabilities. The idea is to use these innovative drones for industrial inspection and maintenance. Recent experimental tests have been successfully carried out in a refinery. The AREA laboratory, in particular, deals with motion control and drone-handling.

Gli UAV (Unmanned Aerial Vehicles), meglio conosciuti come "droni", rappresentano una delle tecnologie maggiormente diffuse negli ultimi tempi, ma le potenzialità di questi strumenti sono tuttora in crescita e oggetto di studi autorevoli. Come quelli svolti nel laboratorio AREA (Automazione, Robotica ed Elettromagnetismo Applicato), importante risorsa dell’Università degli Studi della Basilicata: qui un team guidato dal Prof. Fabrizio Caccavale studia gli UAV mettendoli in correlazione con un’altra delle principali linee di ricerca del laboratorio, la manipolazione robotica.

Il laboratorio lavora anche in collaborazione con il Consorzio C.R.E.A.T.E. (Consorzio di Ricerca per l’Energia, l’Automazione e le Tecnologie dell’Elettromagnetismo), realtà che vuole unire il mondo universitario a quello dell’imprenditoria per accelerare gli sviluppi tecnologici. Infatti il laboratorio AREA, proprio attraverso il Consorzio, è attivo nel progetto europeo AEROARMS e sta lavorando alla realizzazione del primo sistema robotico aereo dotato di bracci meccanici multipli e capacità di manipolazione avanzate. L’idea è quella di utilizzare questi innovativi droni per l’ispezione e la manutenzione industriale. Recenti test sperimentali sono stati effettuati con successo in una raffineria. Il laboratorio AREA – nello specifico – si occupa del controllo del moto e della manipolazione dei droni.
One of the things you appreciate most when you enter a supermarket is the tidiness of the products on the shelves. Robotics can help, in every sense, to have an orderly store. The University of Campania Luigi Vanvitelli team is well aware of this, and is at the forefront of the “REFILLS - Robotics Enabling Fully Integrated Logistic Lines for Supermarkets” project, which aims to create robots capable of filling supermarket shelves, optimising space and avoiding the operator having to lift weights. The project, in collaboration with other universities (Naples, Bremen) and European industries such as Kuka Robotics, Intel, Swisslog, is developed for a supermarket chain and consists of a robotic hand with sensorized fingers to perceive strength and touch and manipulate objects of different shapes, sizes and weights.

The prototype was developed in Aversa in 2010 and validated by testing in Bremen. The engineering phase of the system, the only one of its kind in the world, is currently in progress and should be presented in 2020. The robot will be able to restock shelves of various heights, both collaboratively and autonomously. In the first case, it will assist the salespeople by indicating the correct position of the products; in the second, it will fill the shelves on its own, recognising the products and adopting the best grip to protect them from damage.

Ad Aversa è stato messo a punto il prototipo nel 2010, validato poi con test a Brema. Nel 2019 è in corso la fase di ingegnerizzazione del sistema, unico al mondo, che dovrebbe essere presentato nel 2020. Il robot sarà in grado di rifornire scaffali di varie altezze sia in modalità collaborativa che in autonomia. Nel primo caso assisterà i commessi indicando loro la posizione corretta dei prodotti, mentre nel secondo agirà autonomamente per riempire gli scaffali, riconoscendo i prodotti e adattando la presa migliore per evitare che si danneggino.
In many healthcare facilities, robotics is already a reality, with sophisticated machines that increase the accuracy and dexterity of surgeons. Robots enter the operating rooms and work on patients under the direct control of doctors. A team of engineers at the University of Brescia is working with the neurosurgeons of the city’s Spedali Civili to develop a robotic system for endoscopic operations involving the base of the skull. In these operations, an ENT must hold the endoscope in place even for 6-8 consecutive hours, with workspace limited to a few millimetres. The robot, instead, can share the patient’s space and locks when touched, guaranteeing maximum safety.

The surgeon initially controlled the robot by moving the head. A remote control that detects the doctor’s movement more precisely was later integrated to allow the robotic arm to replicate it. A pedal-controlled test robot is now in use. The University of Brescia is also working on the I-Mech project which involves 26 companies and 5 European universities for the development of a platform, adaptable to different industrial plants, to control the movement of mechatronic systems by correcting any machine errors in real-time. Researchers are working on the study of repetitive actions and optimization of the performance of a crane.

In molte strutture sanitarie la robotica è già realtà, con macchine sofisticate che aumentano l’accuratezza e la dextreza dei chirurghi. I robot entrano nelle sale operatorie e agiscono sui pazienti sotto il controllo diretto dei medici. All’Università di Brescia una squadra di ingegneri collabora con i neurochirurghi degli Spedali Civili della città per sviluppare un sistema robotico per operazioni in endoscopia che interessano la base del cranio. In queste operazioni un otorino deve tenere l’endoscopio in posizione anche per 6-8 ore consecutive, con spazi di lavoro limitati a pochi millimetri. Il robot invece può condividere lo spazio del paziente e, toccandolo, si blocca, garantendo la massima sicurezza.

Inizialmente il chirurgo gestiva il robot muovendo la testa, in un secondo momento è stato integrato un telecomando che rileva in modo più preciso il suo movimento per permettere al braccio robotico di replicarlo. Ora è attivo un robot di prova comandato da pedali. L’Ateneo bresciano è impegnato inoltre nel progetto I-Mech che coinvolge 26 aziende e 5 università europee per lo sviluppo di una piattaforma, adattabile a diversi impianti industriali, per il controllo del movimento di sistemi meccatronici correggendo eventuali errori della macchina in tempo reale. I ricercatori si stanno occupando dello studio di azioni ripetitive e di ottimizzazione delle prestazioni di un carroponte.
The research team of the Industrial Automation Laboratory of the University of Cassino and Southern Lazio is active in various sectors of robotics. For example, it studies the best mechanisms to make the human brain communicate with a robot. The researchers test new architectures and software for control and perception on existing robots, useful to people with paralyzed limbs. They allow the command, given by the user by looking at a screen, to arrive and be understood by the robot. By looking at the screen, the user points an object and a related action, such as a bottle for drinking. The robotic arm picks up the bottle from the table and brings it closer to the user’s mouth, which is recognized by sensors.

Through algorithms that can manage multiple actions at the same time, the robot acts correctly and avoids any obstacles by adapting in real-time to the situation and managing emergencies such as the appearance of an unknown object. The University also participates as a member of ISME (Inter-University Centre for Integrated Systems for the Marine Environment) in submarine robotics projects such as EUMarineRobot in which 24 European centres pool their infrastructure and ROBUST for seabed analysis through the use of an underwater robot with the ability to perform spectroscopy on site.

Il team di ricercatori del Laboratorio di Automazione Industriale dell’Università di Cassino e del Lazio Meridionale è impegnato in vari settori della robotica. Studia ad esempio i meccanismi migliori per far dialogare il cervello umano con un robot. Utilizzando robot esistenti, i ricercatori testano nuove architetture e software di controllo e percezione, funzionali alle persone con arti paralizzati, che consentono al comando, impartito dall’utente guardando uno schermo, di arrivare ed essere compreso dal robot. Con lo sguardo si indica sullo schermo un oggetto e un’azione correlata, ad esempio la bottiglia per bere; il braccio robotico preleva la bottiglia dal tavolo e la avvicina alla bocca dell’utente, riconosciuta tramite sensori.

Attraverso algoritmi che riescono a gestire più azioni contemporaneamente, il robot non solo esegue correttamente l’azione ma evita gli ostacoli che potrebbero aver occupato la scena adattandosi in tempo reale alla situazione e gestendo situazioni di emergenza come la comparsa di un oggetto non conosciuto. L’Ateneo partecipa inoltre come membro di ISME (Centro interuniversitario per i sistemi integrati per l’ambiente marino) a progetti di robotica sottomarina come EUMarineRobot in cui 24 centri Europei mettono a fattore comune le loro infrastrutture e ROBUST per l’analisi dei fondali attraverso l’uso di un robot sottomarino con capacità di eseguire spettroscopia in loco.
Racing is definitely one of the best ways to put skills into practice, learning from oneself, from mistakes and opponents. In the university field, this means also having the opportunity to receive funding to encourage research activities, enhancing the knowledge of the researchers. As it happened to the talented young people of UniCt-Team, the robotics team of the University of Catania led by Prof. Giovanni Muscato. The team made itself known as early as 2017 when it qualified fourth out of 143 participants from around the world in the international robotics competition “Mohamed Bin Zayed International Robotics Challenge” (MBZIRC). There, it presented a smart drone capable of recognizing shapes and land autonomously.

The race, organized by the Khalifa University of Abu Dhabi to encourage the development of robotics, features teams competing in a series of elimination tests using specially developed drones. The UniCt-Team, selected for the 2020 edition, has a new opportunity to win the competition and bring the 5 million dollar prize to Catania to promote research in robotics. The next goal, to pass the first phase, is the development of drones and mobile robots capable of picking up even moving objects.

La gara, organizzata dalla Khalifa University di Abu Dhabi per incentivare lo sviluppo della robotica, vede i team confrontarsi in una serie di prove a eliminazione attraverso l’utilizzo di drone sviluppati appositamente. L’UniCt-Team, selezionata per l’edizione 2020, ha una nuova occasione di vincere la competizione e portare a Catania il premio di 5 milioni di dollari per promuovere la ricerca nella robotica. Il prossimo obiettivo, per superare la prima fase, è lo sviluppo di droni e robot mobili capaci di prendere oggetti anche in movimento.
It is compact and transparent. The researchers who developed it thought it looked like a hippo, so they called it FeelHippo. It is a robot that, like a hippo, gets into water, but it is much smaller, lighter and more agile than the nearly eponymous animal. It was created by researchers at the University of Florence a few years ago, in a much simpler version, to participate in a robotics competition. The robot has been upgraded over the years with new components and has become an essential tool for archaeological research and more. The researchers developed various submarine robots that have taken part in archaeological research campaigns such as TifOne and TifTu, used for mapping submarine sites in the stretch of water between Caesarea and Akko, Israel.

In 2018 and 2019 FeelHippo won the European Robotics League, a challenge between robots on various skill tests, in the underwater robots category. The robot has a load-bearing aluminium structure able to withstand a plexiglass coating; is equipped with detection tools such as cameras that can recognize objects thanks to algorithms based on neural networks, sonars and acoustic modems. FeelHippo can move autonomously, plumbs the seabed and provides geo-referenced images, necessary for the mapping of sunken archaeological sites.

FeelHippo ha vinto nel 2018 e nel 2019 la European Robotics League, sfida tra robot su varie prove di abilità, nella categoria robot subacquei. Il robot ha una struttura portante in alluminio che gli permette di supportare un rivestimento in plexiglass. Dotato di strumenti di rilevazione quali telecamere in grado di riconoscere oggetti grazie ad algoritmi basati su reti neurali, sonar e modem acustico, FeelHippo può muoversi in autonomia, scandagliando i fondali e restituendo immagini georeferenziate, necessarie per la mappatura dei siti archeologici sommersi.
Taking care of people is not easy: everyone has their complexities and tastes. These and other factors need to be taken into account, especially in elderly care, where the treatment may encounter problems that go beyond medication. The European Commission and the Japanese Ministry of the Interior and Communication have therefore decided to finance (within Horizon 2020) CARESSES: a project to develop the first elderly care robot capable of adapting to the culture of patients. 

The coordinator of the study is the University of Genoa, which is working with Prof. Antonio Sgorbissa and his team so that Pepper (anthropomorphic robot produced by SoftBank Robotics and chosen as the protagonist of the research) can understand the preferences of the people it interacts with, learning through communication.

Pepper, thanks to cameras and sensors, recognizes people and remembers the things it learned about them. Its cultural competence is not lost in tradition-bound stereotypes; the robot can adapt to patients. Tested in nursing homes in the UK and Japan with the help of the Universities of Bedfordshire and Middlesex, Pepper will remind the elderly when to take their medication, encourage them to do sports and help them with their routine. Very few will know patients as Pepper does!

Prendersi cura delle persone non è semplice: ognuno ha le sue complessità e i suoi gusti. Bisogna tenere conto di questi e altri fattori soprattutto nell’assistenza agli anziani, dove la cura può riscontrare problemi che vanno al di là dei medicinali. Per questo la Commissione Europea e il Ministero degli interni e della comunicazione del Giappone hanno deciso di finanziare (all’interno di Horizon 2020) CARESSES: progetto per sviluppare il primo robot di assistenza agli anziani capace di adattarsi alla cultura dei pazienti. Coordinatrice dello studio è l’Università di Genova, che sta lavorando con il Prof. Antonio Sgorbissa e il suo team affinché Pepper (robot antropomorfo prodotto da SoftBank Robotics e scelto come protagonista della ricerca) possa rendersi conto delle preferenze delle persone con cui interagisce, apprendendo durante la comunicazione.

Pepper, grazie a telecamere e sensori, riconosce le persone e ricorda le cose che ha imparato su di loro: la sua competenza culturale non si perde in stereotipi legati alle tradizioni, il robot è capace di adeguarsi ai pazienti. Terminata la sperimentazione nelle case di cura di Regno Unito e Giappone con l’aiuto delle Università di Bedfordshire e Middlesex, Pepper ricorderà agli anziani quando prendere le medicine, li incoraggerà a svolgere attività sportive e li aiuterà nella loro routine; pochi conosceranno i pazienti come Pepper!
Coding is becoming more and more popular in schools; it is used to teach programming language to children through interactive games so that they learn to “talk” with computers while having fun. A group of researchers from the University of Milano-Bicocca, led by Edoardo Datteri, Leonardo Mariani and Roberto Previtera, have developed the open-source project CoderBot to make children understand computational thinking. CoderBot is a small educational robot with two wheels and two motors. It can move in a given environment according to the directions provided by the user through a straightforward programming language, which can be modified according to the user’s age or educational needs.

CoderBot is equipped with a camera, distance sensors to recognize and avoid obstacles, a microphone and a loudspeaker to emit sounds or repeat preset sentences. RobotiCSS Lab (Robotics Laboratory for Cognitive and Social Sciences) and the scholars of the Informatics Department make the product aesthetically attractive to the very young students. The educational robot has a friendly look and a familiar expression.

Il coding, che sta prendendo sempre più piede all’interno delle scuole, serve ad insegnare il linguaggio di programmazione ai più piccoli attraverso giochi interattivi, affinché imparino a “dialogare” con i computer divertendosi. Con l’obiettivo di far comprendere ai ragazzi il pensiero computazionale, un gruppo di ricercatori dell’Università degli Studi di Milano Bicocca, guidati da Edoardo Datteri, Leonardo Mariani e Roberto Previtera, ha potenziato il progetto open source CoderBot: si tratta di un piccolo robot didattico dotato di 2 ruote e 2 motori, capace di muoversi in un ambiente a seconda delle indicazioni che gli vengono date dall’utente tramite un semplicissimo linguaggio di programmazione, che può essere modificato a seconda dell’età dell’utente o delle esigenze didattiche.

CoderBot è dotato di una videocamera, riconosce ed evita gli ostacoli che si trova davanti grazie ai sensori di distanza, ha un microfono e un altoparlante, può così emettere suoni oppure ripetere frasi predefinite. Gli studiosi del RobotiCSS Lab (Laboratorio di Robotica per le Scienze Cognitive e Sociali) e del Dipartimento di Informatica hanno lavorato per rendere il prodotto accattivante nell’estetica per i giovaneissimi studenti che si troveranno ad utilizzarlo: il robot didattico ha un aspetto simpatico e un’espressione familiare.
Enabling people and robots to work together in the same workspaces; this is an area in which researchers from the Automation, Robotics and System (ARS) Control laboratory at the University of Modena and Reggio Emilia are working. In such a manufacturing and engine land, it is natural that robotic systems are developed to optimise collaboration between robots and man-robots in industry. The “Pan-Robots” project, conducted with several companies, has improved the perception of the automatic carts used in warehouses. The slowdowns previously necessary to avoid collisions have been eliminated thanks to the possibility for the carts to perceive, through sensors, the presence of other vehicles.

Robots and men need to understand what each other is doing to ensure there is no danger. Also, the use of robots to replicate sinks enamelling and to lighten the worker’s labour has been experimented in the industrial field. The Complement project has made it possible to create cobots that can understand the worker’s level of comfort and intervene in real-time to optimise it. In the “Rossini” project, researchers are developing a new generation of collaborative robots.

Permettere a uomini e robot di collaborare negli stessi spazi di lavoro: anche su questo lavorano i ricercatori del laboratorio di Automation, Robotics and System (ARS) Control dell’Università di Modena e Reggio Emilia. Terra di manifattura e di motori, è naturale che qui si mettano a punto sistemi robotici per ottimizzare la collaborazione tra robot e uomo-robot nell’industria. Grazie al progetto “Pan-Robots”, condotto insieme ad alcune aziende, i ricercatori hanno migliorato la percezione dei carrelli automatici utilizzati nei magazzini: molti rallentamenti prima necessari per evitare collisioni sono stati eliminati grazie alla possibilità dei carrelli di percepire, tramite sensori, la presenza di altri veicoli.

Naples is home to one of the excellences of international robotics; the University of Naples Federico II and its PRISMA Lab robotics laboratory. There, Prof. Bruno Siciliano (one of the leading experts in the field) and his team were inspired by pizza, UNESCO cultural heritage, to create RoDyMan, a robot capable of replicating the movements of a pizza maker. In terms of scientific research, the challenge was to develop a robot capable of manipulating deformable, elastic, non-solid objects - such as water and flour dough - far beyond the skills achieved by technology. The European Research Council awarded RoDyMan (Robot Dynamic Manipulation) a prestigious Advanced Grant of €2.5 million. The fields of application are vast, and RoDyMan aims to become a valuable resource, especially for surgery. In the meantime, it continues to amaze, to the point of conducting an orchestra at Ravello Festival 2019. Robotic surgery is a daily occurrence at Federico II University, which, as part of the MUSHA (Multifunctional Smart Hands) project, has created a miniaturized robotic hand with three fingers, 2.5 cm long and with mechanical ability. A surgical instrument for the Da Vinci system that, inserted into the patient’s body, allows performing complex procedures with greater precision, giving the surgeon the sensation of tissue consistency.
"Win-a-Robot" is the competition launched in 2019 by Epson Europe to award new experiments in robotics and automation. Among the six winners (out of 60 projects submitted from over 20 countries) there’s the Robotics group of the Department of Industrial Engineering of the University of Padua, which was awarded an Epson robot by presenting an idea that connects technology and culinary art. "ChocoBot – Energy-efficient Customized Decoration of Celebration Cakes and Rapid Prototyping of Big Chocolate Structures" offers a solution to the growing demand of the food market for customized products, through a robotic tool capable of delivering high-quality results in a short time.

Cakes, and more; the developed methods are adaptable to various products and industrial sectors. This project joins other research in progress at the University, recently involved with the University of Harvard for the development of “smart pants”, capable of preventing elderly people from falling. In other words, exoskeletons equipped with sensors that record brain inputs and intervene with small mechanical motors in the event of loss of balance; an innovation that could be applied in the future to the world of sport and the army.

Torte, ma non solo: i metodi sviluppati sono adattabili a vari prodotti e settori industriali. Questo progetto si affianca ad altre ricerche in corso presso l’Ateneo, da poco impegnato in una collaborazione con l’Università di Harvard per lo sviluppo di “pantaloni intelligenti”, capaci di prevenire le cadute degli anziani. In sostanza, esoscheletri dotati di sensori che registrano gli input cerebrali e intervengono con piccoli motori meccanici in caso di perdita dell’equilibrio: un’innovazione che in futuro potrebbe essere applicata al mondo dello sport e a quello militare.
A few months ago at the University of Pavia, a new factory-fresh Epson robot was launched. It was the prize won by the team of the Department of Industrial and Information Engineering at the first Epson Europe competition “Win-A-Robot”, thanks to an application that allows the robot to avoid collisions with humans through deep learning techniques (a branch of artificial intelligence for the processing of complex information). The presence of the robot makes it possible to verify the effectiveness of the algorithms to increase security in the man-robot interaction.

The Nao robot featuring an artificial cerebellum appeared in 2018. This is the first result of the Human Brain Project, a European project in which the University participates in collaboration with the Politecnico di Milano, aimed at studying the functioning of the human brain in order to replicate the mechanisms in robots. The researchers have developed a control code that mimics the functioning of the cerebellum cells, allowing the robot to learn from the interaction with the environment and react to stimuli, for example by closing the eyelids or moving logically if pushed or held. The development of this knowledge should lead to connecting the robot’s artificial cerebellum to the cerebral cortex where the action is generated, in order to thoroughly reenact the movement.
Michele Baldassarre, Claudia Costanzo, Miriam Di Mario and Giulia Di Prospero are students enrolled in the master’s degree courses in Management Engineering and Economics at the University of Rome “Tor Vergata”. What is so special about them? They won the Amazon Innovation Award 2018, a competition organized by Amazon Italia that, in this edition, looks for innovative ideas for the warehouse management of the world’s leading e-commerce company. The project, submitted under the guidance of Prof. Schiraldi, focuses on safety at work. The students proposed the creation of a storage robot capable of moving heavy crates, improving Kiva, Amazon’s autonomous robot that moves warehouse shelves.

Xiva, this is the name of the winning prototype, would therefore save the workers the heavy tasks of loading and unloading, by coordinating with them in logistics activities. The University of Tor Vergata has been involved in robotics research for years. As part of the Maker Faire 2018, Professors Luigi Bianchi and Giovanni Saggio presented a BCI (Brain-Computer Interface) system applied to domotics that, through head movements, allows the user to activate or deactivate household components, such as opening a window or turning off the lights in a specific room.

Xiva, questo il nome del prototipo vincitore, eviterebbe quindi ai lavoratori pesanti compiti di carico e scarico, coordinandosi con loro nelle attività di logistica. L’Università di “Tor Vergata” da anni è impegnata nella ricerca in campo robotico. Nell’ambito della Maker Faire 2018, i Professori Luigi Bianchi e Giovanni Saggio hanno presentato un sistema BCI (Brain Computer Interface) applicato alla domotica che attraverso i movimenti della testa permette all’utente di attivare o disattivare componenti della casa, come aprire una finestra o spegnere le luci in un determinato ambiente dell’appartamento.
In 2017, the MIUR listed it among the Italian Departments of Excellence for the quality of research with the highest score. Automatic Control Group of DIEM (Department of Computer Engineering, Electrical Engineering and Applied Mathematics of the University of Salerno) researches in the field of industrial robotics, focusing on the control of multiple robots and man-machine collaboration. Currently, some researchers are involved in the European project H2020 LABOR (Lean robotized AssemBly and cOntrol of composite aeRostructures), in partnership with the University of Campania “Luigi Vanvitelli” and coordinated by the Loccioni group, whose goal is to increase automation in the assembly process of aircraft fuselage parts.

The project includes the development of a solution, to be implemented in Leonardo Aircraft production lines, that uses small-medium robots, cooperating with each other and with man. In other words, a distributed intelligence structure and a system that automatically adapts to the specific situation are to be created. In addition to the prestigious collaborations, DIEM opens up to the territory by promoting the “RobotCup@School” programming competition that has involved 26 high schools in 2019. The students used the University laboratories to program a humanoid robot, competing over the best solutions.

Nel 2017 è stato annoverato dal MIUR tra i Dipartimenti di eccellenza italiani per la qualità della ricerca con il punteggio massimo. Il DIEM, Dipartimento di Ingegneria dell’Informazione ed Elettrica e Matematica Applicata dell’Università di Salerno, con il suo Automatic Control Group, svolge ricerche nell’ambito della robotica industriale incentrate in particolare sul controllo di più robot e sulla collaborazione uomo-macchina. Attualmente alcuni ricercatori sono impegnati nel progetto europeo H2020 LABOR (Lean robotized AssemBly and cOntrol of composite aeRostructures), svolto in collaborazione con l’Università L. Vanvitelli e coordinato dal gruppo Loccioni, il cui obiettivo è aumentare l’automazione nei processi di assemblaggio di parti della fusoliera degli aerei.

Il progetto prevede lo sviluppo di una soluzione, da implementare nelle linee produttive di Leonardo Aircraft, che utilizzi robot medio-piccoli, cooperanti tra di loro e con l’uomo. Ciò significa realizzare un’architettura di intelligenza distribuita e un sistema che si adatti in automatico alla situazione specifica. Oltre alle prestigiose collaborazioni, il DIEM si apre al proprio territorio promuovendo la “RobotCup@School” competizione di programmazione che nel 2019 ha coinvolto 26 scuole superiori. Gli studenti hanno utilizzato i laboratori dell’ateneo per programmare un robot umanoide, sfidandosi sulle migliori soluzioni.
Her name is Annabell and she was born in Sassari in 2015. She sounds like a little girl, actually it’s an artificial neural network: a machine that learns and processes language (almost) from scratch, created by the researchers of the University of Sassari in collaboration with the University of Plymouth, to study the genesis of language in man and build machines that interact with us in a natural way. More recently, the University, as scientific coordinator, has launched the CERBERO project, aimed at developing methods and tools for designing Cyber-Physical Systems, i.e. complex systems that, by interacting intelligently with the outside world, can solve their malfunctions.

Three case studies: the exploration of Mars with the development of robotic components capable of self-diagnosis and self-repair of malfunctions with limited energy; the monitoring of the oceans with the creation of an autonomous submarine drone, able to manage the unexpected events of the underwater world; electric mobility, with the development of an intelligent car that interacts with the driver and optimizes his travel. Currently, the University participates along with the ALOHA project in the implementation of artificial intelligence in everyday devices: the aim is to create systems that learn and decide autonomously or support the user in their everyday life.
The handshake is one of the most iconic gestures of our society; it signs an agreement, confirms mutual trust, binds two human beings and more. But not only that. Soon it will not be strange to see a handshake between man and robot, metaphorical conjunction between the human being and the future that he creates. This image is the basis for relevant research on the control of the interaction force during the man-robot handshake, conducted by SIRSlab of the University of Siena, IIT of Genoa and Disney Research of Zurich.

Among the authors, there’s Domenico Prattichizzo, professor of UniSi, who with his team has developed a robotic prosthesis, Wearable Robotic Sixth Finger, to recover the two-handed ability of subjects who, after a stroke, have permanently lost the use of a hand. It is a real robotic opposable thumb, which is worn as a bracelet. When necessary, it is activated to help patients in daily activities that they could no longer perform otherwise; opening a bottle, put the toothpaste on the toothbrush, carry a shopping bag with the damaged hand. The robotic finger can be activated by the movement of an eyebrow or through a ring that allows perceiving the force of the mechanical thumb grip.
Almost 2 million new cases every year and a mortality rate of about 50%: these are the numbers of colorectal cancer that, if diagnosed in time, could be cured with a simple procedure. Unfortunately, in Europe, only 14% of citizens over 50 years of age undergo screening. The University of Turin, through the Department of Surgical Sciences, has been participating for years in research projects to find alternative diagnostic solutions to colonoscopy, using robotic technology. Prof. Alberto Arezzo, an expert in endoscopic surgery, participated in projects for the development of a flexible surgical robot (STIFF FLOP) and an endoscopic capsule for the diagnosis of gastrointestinal cancer (VECTOR). Arezzo is now involved in the Endoo project, in collaboration with the Sant'Anna School of Advanced Studies of Pisa, Mediate and other partners.

The goal is to create a robot-controlled endoscopic capsule with a soft tail and able to move in a magnetic field moved by an external magnet without generating pain and discomfort. The capsule comes with all the features of a standard colonoscope. The Department's task is to act as a clinical consultant for the group of engineers, to set up protocols and experimental tests of reliability and comparison with traditional colonoscopy, and to set up the first clinical study on volunteers.
The robotics laboratory of the University of Verona was born under a lucky star. Altair (A Laboratory for Teleoperation and Autonomous Intelligent Robots) is named after a star in the Aquila constellation. Founded in 2000, the laboratory studies unconventional robotic systems for surgery, assistance, human-robot interaction; working on control algorithms, simulation environments and vision systems for surgery training and robotic surgery. The laboratory has developed a new tool for breast cancer diagnosis, combining existing imaging and robotics technologies.

Altair participates in the MURAB (MRI and Ultrasound Robotic Assisted Biopsy) project launched in 2016, which aims to improve the accuracy of biopsies by combining ultrasound and MRI images collected by a robot. A probe moved by a robotic arm scans the breast while a pressure sensor collects data on tissue hardness. The software, using the images and data collected, creates a 3D model giving back the exact position of the lump and the optimal angle through which to perform the biopsy. The robot is then placed in the correct position, and the doctor can insert the needle through the guide down to the indicated depth.
In 2019, the University hosted RomeCup, the prestigious and innovative annual event on robotics organized by Fondazione Mondo Digitale. The event involved thousands of young people from elementary schools to universities, as evidence that it is attentive to this topic. Since 2017 at Roma Tre University, “PANTHEON”, the European project H2020 for robotics in agriculture, is in the works. The Department of Engineering coordinates a consortium formed by three other universities (Free University of Brussels, Trier University and Tuscia University) and two industrial partners (Sigma Consulting and Ferrero) for the development of solutions for precision agriculture.

The aim is to improve hazelnut groves management, creating a robotic system that monitors the health of plants by intervening on each according to the needs. Therefore, a central control system is required to collect data from the network of sensors and robots (drones and ground vehicles) in the field. The data are processed to provide support to the agronomist, plan robot activities, send commands to other systems (such as irrigation) and support the activities of farmers in the field. This system significantly improves the quality of cultivation, guaranteeing higher environmental sustainability and efficiency through the reduction of phytosanitary interventions and the optimization of production factors.
One of the most classic images of man’s conquest of space is that of the rovers crossing lunar landscapes or insidious terrains on Mars by taking photographs and collecting data. Often, however, it is difficult, or even impossible, to control these robots from our planet, so they must have high levels of autonomy. The ADE project (Autonomous DEcision Making in very long traverses), born within the European Horizon 2020 program, recently entrusted the University of Salento with the task of enabling rovers to make their own choices according to the conditions they face, without the guidance of man.

Prof. Giulio Reina and his team of researchers in Applied Mechanics plan to assign to the robotic explorers a specific destination of scientific interest and ensure that their driving system can choose autonomously the best way to reach it efficiently and without any accidents. The rovers will have to avoid any obstacle and difficult surfaces, impervious or irregular, even on stretches of several kilometres a day. The island of Tenerife is the chosen location for the first practical tests; here, the ground has many similarities with the surface of Mars.

Il Prof. Giulio Reina e il suo team di ricercatori di Meccanica Applicata hanno già definito l’obiettivo di assegnare ai robot esploratori una determinata meta di interesse scientifico e far sì che il loro sistema di guida sia in grado di scegliere autonomamente la strada migliore per giungere a destinazione con facilità e senza riscontrare incidenti. Questo significa che i rover dovranno evitare durante il percorso qualunque tipo di intralcio e superfici ostiche, impervie o irregolari, anche lungo tratti di diversi chilometri al giorno. L’isola di Tenerife è la meta scelta per i primi test pratici: qui il suolo presenta numerose analogie con la superficie di Marte.
The evolution of robotics is primarily a matter of training and research. For this reason, the University of Bologna has activated, starting from the academic year 2019/2020, a bachelor’s degree course in Mechatronic Engineering and an international master’s degree course in Artificial Intelligence.

In 2017, researchers were able to understand how we grasp an object by recording the neural activity of the brain in the posterior parietal cortex. This way, those who have suffered damage to the spinal cord can move an arm or a robotic hand solely through thought.

The University is obtaining new results after the successful conclusion of the European SHERPA project, which today has become AirBorne, an EU-funded initiative for the use of drones in mountain rescue. During the first phase, a drone able to quickly locate the missing persons during avalanches was integrated into the rescue group. The drones can catch the electromagnetic waves emitted by the transmitters given to the hikers. In this way, rescue operations can proceed quickly and far from difficult operational conditions. AirBorne is now in its final development phase, i.e. the application of the service in real avalanche situations and the industrialization of the drone.


Marche Polytechnic University is one of the founders of the competence centre ARTES 4.0 (Advanced Robotics and enabling digital Technologies & Systems 4.0) to develop innovative technologies and products in the most current fields of smart industry. In addition to research dedicated to the underwater robotics, with devices for data collection for use in archaeology and aerial applications for inspection and monitoring, the University develops measurement systems for services in industry, smart cities and built environment.

Many projects are aimed at improving the quality of life of people with robotic assistive solutions for the mobility of the disabled and the interaction between man and robot, including eWare (Early Warning Accompanies Robotics Excellence) for the assistance of people with dementia. The project (AAL program) develops an ecosystem through two technologies: one to monitor the lifestyle of older people (Sensara Senior Lifestyle System) and one for social robotics (Tinybot). The first consists of sensors that can be installed at home that collect data about what happens by tracking people’s habits, the second consists of robots that interact with people giving them tips, directions and sensory stimuli.
Investing in research and development is the only way to create innovation, as demonstrated by the history of ValueBiotech; a startup founded in 2012 by Dr Antonello Forgione, surgeon specialized in minimally invasive procedures at the Niguarda Cà Granda Hospital in Milan. The company was created to develop a robotic surgical device capable of operating without leaving visible scars. It is called M.I.L.A.N.O. (Minimal Invasive Light Automatic Natural Orifice Robot) and vows to revolutionize robotic surgery. It is so small that it can completely fit into the patient’s abdomen, in laparoscopy or through a natural orifice. It features high-definition 3D cameras and can autonomously change the tool it uses, while always remaining under the direct control of the surgeon.

Since it is entirely different from any device in use, each piece has been made from scratch. The aim is to offer a reliable and economical instrument, which increases the quality of the procedures making the patients’ recovery faster. Winner of the Leonardo Prize awarded by the President of the Republic, ValueBiotech received 2 million euros in funding; one of which from the Government of Israel, which asked the company to move its laboratories to Tel Aviv where it continues to develop the prototype.


Essendo completamente diverso da qualiasi dispositivo in uso, ogni pezzo è stato realizzato da zero. Lo scopo è quello di offrire uno strumento affidabile ed economico, che aumenti la qualità degli interventi rendendo il recupero dei pazienti più veloce. Vincitrice del Premio Leonardo conferito dal Presidente della Repubblica, ValueBiotech ha ricevuto un finanziamento di 2 milioni di euro, di cui 1 dal Governo di Israele che ha chiesto all’azienda di portare i suoi laboratori a Tel Aviv dove continua lo sviluppo del prototipo.
The efficiency of a robot or intelligent machine also depends on the quality of its components; one of the most important is the machine vision system, which allows automatic control or automation operations to be carried out. Since 1988, Vision Device has been using the know-how of Paolo Raschiatore (founder of the company) to create dedicated Quality Control and Flexible Industrial Automation systems, using the technologies of artificial vision, robotics and data collection. The success of the company from Torrevecchia Teatina (CH) can be measured by the names of some international clients, such as Dayco, Denso, Ducati, Ferrari, M. Marelli, FCA, SKF.

Vision Device has created for the food industry a unique recognition system for long pasta. The company focuses on the development of vision systems for production control, allowing its clients to speed up production and minimize errors and costs, detecting any defects, inspecting up to 90,000 components in just one hour. Vision Device follows the client in all phases of product development, from tailor-made design to factory installation, training the staff on the use of the machines and ensuring continuous assistance.

L’efficienza di un robot o di una macchina intelligente dipende anche e soprattutto dalla qualità dei componenti utilizzati: uno dei più importanti è il sistema di visione artificiale, che consente di compiere in modo automatico operazioni di controllo o automazione. Vision Device dal 1988 mette a frutto il know-how dell’ing. Paolo Raschiatore (fondatae dell’azienda) creando sistemi dedicati di Controllo Qualità e di Automazione Industriale Flessibile, utilizzando le tecnologie della visione artificiale, robotica ed acquisizione dati. Il successo dell’impresa di Torrevecchia Teatina (CH) si può misurare già dai nomi di alcuni clienti internazionali, come Dayco, Denso, Ducati, Ferrari, M. Marelli, FCA, SKF.

In particolare, per l’agroalimentare Vision Device ha creato un sistema di riconoscimento per la pasta lunga in movimento, unico nel suo genere: l’azienda infatti si concentra sullo sviluppo di sistemi di visione per il controllo della produzione, consentendo ai propri clienti di accelerare la produzione e minimizzare gli errori e i relativi costi, rilevando ogni eventuale difetto, ispezionando fino a 90.000 componenti in un’ora soltanto. Vision Device segue il cliente in tutte le fasi di realizzazione del prodotto, dalla progettazione tailor made fino all’installazione in fabbrica, formando il personale addetto sull’utilizzo dei macchinari e garantendo un’assistenza continua.
Those who have suffered trauma know well how long and tiring rehabilitation can be, and how often it is made up of movements that need to be repeated in the same way. ALEx is the robotic “physiotherapist” developed to support the work of healthcare professionals and patients. ALEx was born in the Wearable Robotics laboratories, a spin-off of the Sant’Anna School of Advanced Studies of Pisa to support upper limb rehabilitation, in particular of patients affected by stroke or other neurological diseases. The system becomes an extension of the practitioner: the therapist determines the type and intensity of movement that the patient must make, adjusting each axis of the robot, customizing the therapy.

The arm guides the patient’s movement allowing him to reproduce everyday activities, also through games and virtual reality. By detecting even the slightest hint of movement, ALEx provides assistance that varies according to the needs of the patient. The company from San Giuliano Terme (PI) is participating in the “Wearable Walker” project for the creation of a prototype of a wearable robotic device for the lower limbs, useful for people with walking difficulties. The system will feature a central body consisting of a backpack and two legs capable of reproducing real movements, will be less bulky than other systems, equipped with control sensors and capable of wide movements.

Chi ha subito un trauma sa bene quanto possa essere lunga e faticosa la riabilitazione, fatta spesso di movimenti da ripetere sempre uguali. ALEx è il “fisioterapista” robotico sviluppato per sostenere il lavoro di operatori sanitari e pazienti. Nasce nei laboratori di Wearable Robotics, spin-off della Scuola Superiore Sant’Anna di Pisa per supportare la riabilitazione degli arti superiori, in particolare di pazienti colpiti da ictus o altre malattie neurologiche. Il sistema non si sostituisce all'operatore ma ne diventa l’estensione: il terapista determina il tipo e l’intensità di movimento che il paziente deve effettuare, regolando ogni asse del robot, personalizzando la terapia.

Il braccio accompagna il movimento del paziente consentendogli di riprodurre le azioni quotidiane, anche attraverso giochi e realtà virtuale. Rilevando le intenzioni anche solo accennate di movimento, ALEx fornisce un’assistenza variabile in base alle esigenze dei pazienti. L’azienda di San Giuliano Terme (PI) partecipa al progetto “Wearable Walker” per la realizzazione di un prototipo di dispositivo robotico per arti inferiori indossabile, utile a soggetti con problemi di deambulazione. Il sistema avrà un corpo centrale costituito da uno zaino e due gambe in grado di riprodurre movimenti reali, sarà meno ingombrante di altri sistemi, dotato di sensoristica di controllo e capace di movimenti molto ampi.
It's called Yape and in 2019 it won the German Design Award, one of the most important international design awards. Now an icon of Made in Italy hi-tech, Yape (Your Autonomous Pony Express) is an autonomous guided robot suitable for last mile deliveries in the city, designed and developed by E-Novia, the Enterprise Factory in Milan. The company is a talent scout for technological ideas: it looks for them, transforms them into products and creates new companies that can stand on the market. Included by the Financial Times among the thousand fastest-growing companies, it started 30 entrepreneurial projects and in 2018 generated 8.4 million euros in revenue.

Yape is a robot that delivers goods at home. On two wheels, it can move on sidewalks at 6 km/h and on cycle paths up to 20 km/h. Its cameras and sensors allow it to understand where it is while avoiding obstacles and recognising the faces of shippers and recipients, preventing strangers from picking up goods. By interfacing with the sensors located around the city, it closely monitors the route, creating a map that collects useful information, including the presence of potholes. Yape is undergoing testing in Italy and since December 2018 has also landed in Japan where it has carried out some delivery tests in agreement with the local postal service, and at Frankfurt airport where it guides travelers to the gate.
Zucchetti Centro Sistemi (ZCS) is a company which has been awarded many innovation prizes, one of them being the Innovation Prize, established by the Presidency of the Council of Ministers. Such a world-class curriculum was not created by chance. It is the result of the commitment of many people and the farsightedness of entrepreneur Fabrizio Bernini, who in 2017 was appointed Knight of the Republic. In 1985 Bernini founded this company in Terranuova Bracciolini (AR), which today has a turnover of 80 million euros and exports to 55 countries around the world. The company was born for the design of management software, has developed in the field of mechatronics and currently consists of five business units (Automation, Healthcare, Green Innovation, Robotics, Software), supported by the “Laboratorio delle Idee” born in 2005, where new projects are created.

Ambrogio and NEMH$_2$O, two small robots designed to assist man in cleaning operations, are born from the forge of ZCS. Ambrogio is an autonomous lawnmower robot which takes care of the garden, saving time and contributing to environmental sustainability, programmed and controlled through a smartphone app. NEMH$_2$O is a robot able to clean swimming pools moving both on the bottom and the walls in safety. The robot has sensors that optimize the movements, is programmed through an app, is wireless, and is equipped with independent in-water by induction recharge.
100 ITALIAN ROBOTICS & AUTOMATION STORIES

AEROSPAZIO: Argotec | ASI - Agenzia Spaziale Italiana | IIS Sansi Leonardi Volta | Istituto d'Istruzione Superiore Avogadro | Leonardo | Università del Salento | AGRICOLTURA: Demur | Università degli Studi Roma Tre | AUTOMAZIONE: Alumotion | AutomationWare | BM Group Polytec | BNP | Bonfiglioli | CMA ROBOTICS | COMAU | Cosberg | Danieli Telerobot Labs | Datalogic | Egicon | Fameccanica | Gaiotto Automation | IMA | Inventio | IUVO | Loccioni | Prima Industrie | qrobotics | Roboticom | Robox | Smart Robots | Springa | STMicroelectronics | Tiesse Robot | Vision Device | AUTOMOTIVE: Italdesign | Roboteco Italargon | DIVULGAZIONE: Fondazione Mondo Digitale | l-RIM | OFpassiON | Scuola di Robotica | SIRI -Associazione Italiana di Robotica e Automazione | UCIMU-SISTEMI PER PRODURRE | DOMOTICA: Zucchetti Centro Sistemi | EDUTAINMENT E SPORT: Maker Faire Rome | Makr Shakr | Robotech | Sapienza Università di Roma | Stripes Cooperativa Sociale | Università degli Studi di Milano Bicocca | LOGISTICA: Elettric80 | Rollon | Scaglia INDEVA | TactileRobots | Università degli Studi della Campania Luigi Vanvitelli | Università degli Studi di Roma Tor Vergata | Yape | NURSING/ASSISTENZA: Mediate | Università degli Studi di Genova | RICERCA: Centro Ricerche E. Piaggio - Università di Pisa | CNR | Co-Robotics | ENEA | IIT | Politecnico di Bari | Politecnico di Torino | Scuola Superiore Sant'Anna | Università degli Studi della Basilicata | Università degli Studi di Cassino e del Lazio Meridionale | Università degli Studi di Catania | Università degli Studi di Modena e Reggio Emilia | Università degli Studi di Napoli Federico II | Università degli Studi di Padova | Università degli Studi di Pavia | Università degli Studi di Salerno | Università degli Studi di Sassari | Università degli Studi di Siena | Università Politecnica delle Marche | SALUTE: ABzero | BionIT Labs | ddp studio | Elastico Disegno | Era Endoscopy | Inail | Khymeia | Masmec | Medical Microinstruments | Movendo Technology | Politecnico di Milano | Prensilia | Università Campus Bio-Medico di Roma | Università degli Studi di Brescia | Università degli Studi di Torino | Università degli Studi di Verona | ValueBiotech | Wearable Robotics | SICUREZZA: Aslatech | MDMTeam | NuZoo Robotics | Università degli Studi di Firenze | Università di Bologna Alma Mater Studiorum