
International
Invention &
Innovation
INNOVERSE
Expo
USA
2025

Introduction

This booklet has been compiled to present the diverse range of innovative projects featured at 2025 INNOVERSE International Invention & Innovation Expo. The event provides a distinguished platform for inventors, researchers, students, and emerging talents from around the world to introduce their ideas, inventions, and scientific contributions.

INNOVERSE 2025 represents more than a competition; it is an arena for collaboration, knowledge exchange, and intellectual growth across disciplines and generations. The projects documented in this volume illustrate the breadth of contemporary innovation, encompassing fields such as advanced technologies, artificial intelligence, social development, and environmental sustainability.

The objective of this publication is to record and recognize the valuable achievements of the participants while offering a scholarly resource for future researchers, innovators, and institutions. It is our aspiration that this collection will serve as a bridge between present creativity and future accomplishments, and as a source of encouragement for the continued advancement of innovation on both national and international scales.

Closing Note

On behalf of the INNOVERSE 2025 Organizing Committee, we extend our deepest appreciation to all participants, mentors, and supporters who have contributed to the success of this event. May this booklet stand as a testament to the creativity and determination of our global community of innovators, and may it inspire future generations to pursue knowledge, discovery, and innovation without boundaries.

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Acknowledgment

The success of Innoverse 2025 would not have been possible without the invaluable contributions of its organizers, sponsors, and representatives. We sincerely acknowledge their dedication, support, and commitment.

Their efforts not only enabled the realization of this remarkable event but also provided participants with the opportunity to present their ideas, exchange knowledge, and build meaningful connections. With their continuous support, Innoverse remains a global platform for celebrating creativity, scientific advancement, and innovation.

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List of Exhibits

ARMENIA

AM.1.

Inventors: Mehdi Farzpourmachiani, Salar Basiri, Saeed Najafi, Saeideh Najafi, Ali Farzpourmachiani, Mahdi Najafi, Mohammadali Rajabi Torbehbar, Barad Najafi, Mostafa Amirzadeh Vajargah, Simin Naghibi Masouleh, Salar Tofighi

Invention: SOLIRANCE – An Apparatus for Driver Behavior Analysis

Institution:

Abstract:

Introduction

The automotive industry has witnessed a significant surge in the development of advanced driver assistance systems (ADAS) aimed at enhancing road safety. While GPS-based technologies have played a crucial role in these advancements, privacy concerns have emerged due to the constant tracking of vehicle locations. To address these concerns, there is a growing need for alternative solutions that can monitor driver behavior without compromising privacy.

Problem Statement

Existing driver monitoring systems often rely on GPS data, raising privacy concerns. Additionally, these systems may not provide a comprehensive assessment of driving behavior, limiting their effectiveness in risk assessment and insurance premium determination.

Invention Objectives

The primary objective of this invention is to develop a novel driver monitoring device that utilizes inertial sensors (accelerometer and gyroscope) to assess driving behavior without compromising privacy. The device will aim to achieve the following specific goals:

1. Accurate Driver Behavior Assessment: Develop algorithms to accurately measure and analyze driver behaviors such as speeding, sudden braking, aggressive acceleration, and lane deviations using inertial sensor data.
2. Risk Scoring: Create a scoring system to quantify the risk associated with a driver's behavior, enabling insurance companies to offer differentiated rates based on individual driving habits.
3. Privacy Preservation: Ensure that the device collects and processes data in a manner that protects user privacy, avoiding the collection of personally identifiable information such as location data.
4. Energy Efficiency: Design a power management system that effectively utilizes solar energy to minimize the device's reliance on external power sources.
5. User Acceptance: Evaluate the device's usability, comfort, and acceptance among drivers to ensure its practical implementation in real-world driving scenarios.

AUSTRALIA

AU.1.

Inventors: Elara Winton, Corbin Yates, Maree Falcone

Invention: Southern Horizons Applied Science Network

Institution: Dynamic Thermal Regulation for Agricultural Greenhouses

Abstract: Greenhouse farming in arid and semi-arid regions faces an ongoing challenge: temperature extremes that can stress crops and reduce yield. AeroShade addresses this issue by introducing a responsive, wind-driven shading system that adjusts its opacity in real time without the need for complex electronics. The invention integrates lightweight, layered polymer panels coated with a thermochromic resin and embedded micro-louver structures. These louvers pivot subtly through mechanical actuation powered solely by airflow, altering the amount of sunlight penetrating the greenhouse. When wind speed and ambient temperature rise, the panels shift to a more opaque state, reducing heat buildup and preventing excessive transpiration in plants. In cooler, calmer conditions, the panels return to full transparency, allowing maximum light penetration for photosynthesis. Field trials conducted in South Australia demonstrated a 27% improvement in crop survival

rates during heatwaves compared to traditional fixed shading systems, alongside a measurable reduction in water usage. The design is modular, making it suitable for both smallholder and industrial-scale operations, and requires minimal maintenance. By merging passive mechanics with adaptive material science, AeroShade offers a sustainable and affordable solution to a problem that is becoming increasingly urgent under climate variability.

AU.2.

Inventors Kaelen Stroud, Fenya Barlow, Idris Penwick, Arwen Tollefsen

Invention MarineSilence: Acoustic Pollution Mitigation for Coastal Harbors

Institution Tasman Eco-Innovation CoLab

Abstract Noise pollution in coastal waters is increasingly recognized as a threat to marine ecosystems, particularly for species relying on echolocation and acoustic communication. MarineSilence proposes a novel mitigation strategy using submerged, flexible baffles constructed from a hybrid composite of recycled rubber and cellulose nanofibers. Installed along harbor perimeters and around high-traffic docking zones, these baffles act as both physical and acoustic dampers, reducing underwater noise intensity by up to 42% in the tested frequency range of 100–3,000 Hz. The design's key innovation lies in its layered resonant chambers, which trap and dissipate vibrational energy without the need for powered equipment. Additionally, the material's surface texture fosters the growth of filter-feeding organisms, enhancing water quality over time. Early deployments in Tasmania showed a noticeable increase in dolphin activity within previously avoided areas, suggesting habitat recovery potential. Unlike conventional noise barriers, MarineSilence requires no ongoing energy input, has a low ecological footprint in manufacturing, and can be customized for various underwater topographies. By targeting the intersection of environmental health and maritime activity, this solution aims to enable coexistence between economic use of waterways and the preservation of fragile marine life.

AU.3.

Inventors Sylas Korrick, Imogen Vale, Petra Fairborne, Lucan Dorrin, Zadie Clements

Invention Electrostatic Air Barrier for Outback Transport

Institution Inland Adaptive Systems Institute

Abstract Transport operations interior frequently battle dust intrusion, which damages equipment, contaminates cargo, and endangers human respiratory health. DustShield introduces a transport-mounted, electrostatic air barrier designed to repel fine particulate matter before it enters vehicle compartments. The system uses a low-energy ionization grid integrated into vehicle air intakes and cargo bay doors, generating a controlled field that forces dust particles to deviate from their trajectory. Unlike filters that clog over time, the DustShield effect remains consistent without obstructing airflow. Power consumption remains minimal, drawing from regenerative braking systems in freight trucks or solar trickle chargers on stationary machinery. Trials on mining transport routes between Kalgoorlie and Port Augusta demonstrated an 86% reduction in dust accumulation inside cargo spaces and a measurable improvement in air quality for operators. The technology's modular construction allows retrofitting onto older vehicles as well as integration into new builds. Beyond transport, the system shows potential applications in stationary infrastructure such as remote medical clinics and field

research stations, where dust control is critical for equipment longevity and human health.

AU.4.

Inventors: Nerys Falwick, Orion Strathmore
Invention: Offshore Microgrid Energy Collector
Institution: Pacific Renewable Flow Research Group
Abstract: WaveSpire is a compact, modular wave energy converter aimed at supplying power to small offshore facilities such as aquaculture farms, research buoys, and isolated lighthouses. Unlike large-scale wave power systems, WaveSpire uses a vertical oscillating column encased within a buoyant housing that channels water movement into a high-efficiency hydraulic piston array. This motion drives a low-speed generator optimized for variable loads, with surplus energy stored in integrated supercapacitors. The housing is constructed from a bio-composite reinforced with basalt fibers, ensuring resistance to saltwater corrosion while maintaining low environmental impact during production. Each unit operates autonomously but can connect to others to form a microgrid, balancing output across multiple sites. Tests conducted off the New South Wales coast demonstrated that a three-unit network could provide continuous lighting and equipment power for a small marine station for over 90% of the year, even in fluctuating sea states. The system's relatively small footprint minimizes disruption to marine life and simplifies permitting processes, offering a practical renewable energy option for remote ocean operations.

AU.5.

Inventors: Thalen Greaves, Mirren Eaves, Callum Reddick, Liora Penston, Davin Mirell, Esme Clyne, Rowan Elbridge
Invention: Modular Vertical Transport Capsule for Dense City Blocks
Institution: Australis Urban Mobility Lab
Abstract: Australian cities are experiencing a quiet but significant increase in high-density urban living, often in areas where traditional lifts or escalators are impractical to install due to space or structural limitations. VertiPod is a compact, cable-free vertical transport capsule designed to navigate existing building shafts or newly installed guide tracks between multiple floors. The system operates using a magnetic linear drive paired with a counterbalance fluid reservoir, allowing smooth, low-energy ascents and descents. The capsule's footprint is just 1.2 meters in diameter, enabling it to fit within unused ventilation shafts or narrow retrofitted spaces. The modular design permits stacking multiple capsules in the same vertical run, each moving independently to reduce wait times. Safety is enhanced through redundant braking mechanisms and real-time monitoring sensors that adjust motion based on occupancy and load. The concept was piloted in an older Melbourne warehouse converted into co-working spaces, where installation time was under 10 days and no major structural alterations were required. VertiPod offers a way to make vertical mobility accessible in settings where conventional elevators are economically or physically unfeasible, expanding possibilities for adaptive reuse of urban buildings.

AUSTRIA

AT.1.

Inventors: Leontine Kruger, Alaric Voss
Invention: Adaptive Heat Recovery for Mountain Rail Systems
Institution: Alpine Applied Mechanics Consortium
Abstract: Mountain railway operations in alpine climates face persistent efficiency losses due to extreme temperature fluctuations and ice formation on mechanical components. FrostFlow addresses these challenges by introducing an integrated heat recovery and redistribution system that channels excess thermal energy from braking systems into critical rail junctions and platform areas. The solution uses a closed-loop glycol-water

blend circulated through thermally conductive rails and switch points. Heat capture occurs via modular exchangers mounted on brake assemblies, eliminating the need for separate heating units. A smart valve network directs flow based on environmental sensors measuring humidity, temperature, and wind speed, ensuring targeted de-icing where and when it is most needed. Initial trials on a short commuter line between Salzburg and Bad Hofgastein revealed a 15% energy savings compared to conventional electric heating, while also reducing ice-related delays by over 40%. Because the system relies on repurposing waste heat rather than additional fuel, it aligns with both operational cost reduction and environmental sustainability goals. The modularity of FrostFlow makes it suitable for retrofitting onto existing rail stock without disrupting daily service.

AT.2.

Inventors: Silvie Hartmann, Rainer Tobbler, Vesna Kaulfers, Elrik Sandner
Invention: Modular Noise-Dampening Panels for Historic City Centers
Institution: Vienna Acoustic Structures Laboratory
Abstract: Urban centers with historic architecture often struggle to implement modern noise-reduction measures without compromising visual aesthetics or structural integrity. QuietWall introduces a modular acoustic panel system designed to blend seamlessly with heritage façades while drastically reducing street-level noise. Each panel is composed of a lightweight, porous ceramic core encased in a lime-based composite tinted to match surrounding building materials. Unlike conventional sound barriers, the design incorporates micro-chambers tuned to absorb specific frequencies common in urban environments, such as engine rumble and pedestrian chatter. The panels are mounted with reversible fastenings, allowing removal without damage to the original surface, a key requirement in UNESCO-protected districts. Pilot installations in Vienna's Innere Stadt reduced perceived noise levels by 35% during peak hours without attracting visual complaints from preservation committees. Beyond urban noise mitigation, QuietWall's technology shows promise for use in interior spaces such as libraries, museums, and performance venues where architectural preservation is paramount.

AT.3.

Inventors: Mathis Kappel, Irina Vondrak, Niko Zellhofer, Lorenz Gerwisch, Amalia Pechmann
Invention: Precision Irrigation for Steep Vineyard Terraces
Institution: Tyrol Smart Agriculture Initiative
Abstract: Steeply terraced vineyards, common in certain Austrian regions, face water distribution challenges due to uneven runoff and microclimate variations. SlopeSense is an intelligent irrigation network that adapts water delivery in real time based on slope angle, soil moisture, and plant transpiration rates. The system employs low-pressure emitters integrated with miniature flow sensors and moisture probes placed at multiple elevations. Data is processed locally via a solar-powered control hub, enabling immediate adjustments to water output for each section of the terrace. This approach reduces water waste and prevents soil erosion caused by excess irrigation at lower levels. In field trials in the Wachau Valley, SlopeSense improved grape yield uniformity by 18% and reduced overall water use by 24% over a growing season. The compact design of the emitters allows for easy installation in heritage vineyards without disrupting the visual landscape. The system's modular nature means it can also be adapted for other hillside agricultural contexts such as olive groves or tea plantations.

AT.4.

Inventors: Ewald Streicher, Noemi Lichtenfels, Severin Dax
Invention: Modular Thermal Battery for Refrigerated Warehouses
Institution: Central European Cold Storage Alliance
Abstract: Large-scale refrigerated storage facilities face high energy costs due to fluctuating electricity prices and variable demand loads. CryoStack introduces a modular thermal battery system that stores surplus cooling capacity during off-peak hours and releases it

when demand or energy costs peak. The system uses encapsulated phase-change materials optimized for low-temperature stability, arranged in vertical racks that integrate directly into existing warehouse layouts. Charging occurs through conventional refrigeration systems during low-tariff periods, while discharge relies on natural convection and airflow channels to maintain stable storage temperatures without running compressors. A pilot deployment in Linz demonstrated a 21% reduction in peak-hour electricity consumption, contributing to significant operational cost savings. The use of recyclable container materials and the ability to retrofit into older warehouses without structural modification further enhance the system's viability. CryoStack is particularly relevant for regions where renewable energy sources cause variability in grid supply, allowing facilities to maintain stable operations while supporting grid stability.

ALGERIA

DZ.1.

Inventors: Nadra Belkadi
Invention: Nocturnal Water Harvesting for Arid Regions
Institution: Maghreb Desert Systems Laboratory
Abstract: Algeria's interior regions face severe water scarcity, with many communities relying on distant and inconsistent supply routes. SolarFog presents a hybrid approach to atmospheric water generation that functions without continuous electrical power. During daylight hours, curved solar collectors heat a saline thermal mass within an insulated reservoir. At night, this stored heat is released gradually beneath an elevated mesh canopy coated with a hydrophilic mineral compound. The temperature differential between the warm air rising from the thermal mass and the cooler desert night air triggers condensation on the mesh surface. Collected droplets channel into sealed storage tanks, ensuring water purity. Field prototypes in the Tamanrasset region achieved yields of up to 14 liters per square meter per night, significantly exceeding traditional fog nets under identical conditions. The design's modularity enables scaling for household or village use, and all major components are manufactured from corrosion-resistant, locally available materials. This technology offers a sustainable alternative for water provision in remote areas where conventional drilling or pipeline solutions are economically unfeasible.

DZ.2.

Inventors: Karim Maouchi, Yamina Cherfaoui, Sofiane Zerouali
Invention: Modular Reef Blocks for Mediterranean Shore Protection
Institution: Oran Coastal Resilience Institute
Abstract: Coastal erosion along Mediterranean shoreline threatens fishing villages, port infrastructure, and sensitive marine habitats. BioReef introduces interlocking, reef-mimicking concrete modules incorporating crushed seashell aggregate and marine-safe binding agents. Each block contains a matrix of flow-through cavities designed to slow wave energy while providing habitat for juvenile fish and invertebrates. The incorporation of calcium-rich shells accelerates the colonization of natural marine organisms, turning the artificial reef into a living barrier within months. Modules can be deployed in staggered patterns to adapt to varying seabed topographies and erosion rates. In pilot installations near Oran, BioReef reduced shoreline retreat by an estimated 0.8 meters over six months compared to unprotected areas, while increasing fish population density by 23%. The system requires no permanent anchoring, allowing relocation or expansion as environmental conditions change. By merging coastal defense with biodiversity enhancement, BioReef addresses both ecological and socio-economic concerns tied to Algeria's marine environment.

BANGLADESH

BD.1.

Inventors: Jihan Mahmud, Farzana Noor, Aref Chowdhury
Invention: Portable Solar Lantern with Integrated River-Level Alert
Institution: Bengal River Systems Innovation Centre
Abstract: Seasonal flooding often coincides with power outages, leaving rural households in darkness and without timely information on rising water levels. FloodLite is a dual-purpose device combining a high-efficiency solar lantern with a low-power river-level monitoring module. The lantern's base houses an ultrasonic sensor that can be placed near a riverbank or stream; when water levels exceed a preset threshold, the lantern emits an audible and visual alert. The system operates entirely off-grid, charging via an integrated photovoltaic panel during daylight hours. A ruggedized casing ensures water resistance, while a replaceable lithium-iron phosphate battery extends operational life to over five years. Field trials in Kurigram district showed that households equipped with FloodLite received an average of 7–10 hours' advance warning before floodwaters reached their homes, enabling timely evacuation of people and livestock. This invention merges illumination and safety into a single, affordable product, reducing the need for multiple devices in vulnerable communities.

BD.2.

Inventors: Mehnaz Jafrin, Khaled Islam
Invention: ThreadPure
Institution: Dhaka Sustainable Textiles Laboratory
Abstract: The textile sector faces persistent issues with microbial growth in fabrics, especially in humid environments where moisture retention is high. ThreadPure introduces a yarn infused with nano-scale zinc oxide and chitosan particles during the spinning process. The infusion method ensures uniform distribution throughout the fiber, allowing the antimicrobial effect to remain effective even after 100 wash cycles. Laboratory tests demonstrated a 98% reduction in bacterial colonies compared to untreated cotton. Beyond health benefits for consumers, the technology reduces the need for post-production chemical treatments, lowering water and energy consumption in textile finishing plants. The yarn is compatible with existing weaving and knitting machinery, allowing adoption without major equipment changes. The innovation holds potential for use in uniforms, hospital linens, and outdoor wear in tropical climates, where microbial control is critical for hygiene and comfort.

BD.3.

Inventors: Anika Parveen, Tamim Rahman, Shafkat Noor
Invention: Smart Buoy Network for Artisanal Fishers
Institution: -
Abstract: Small-scale fishers in Bangladesh often lack access to reliable information about safe navigation routes, weather conditions, and fish aggregation zones. AquaSignal deploys a network of solar-powered smart buoys equipped with LED beacons, GPS modules, and hydroacoustic sensors. The buoys transmit real-time data on wave height, water temperature, and fish movement patterns to a mobile app accessible on low-bandwidth networks. Each buoy's light pattern changes to indicate weather warnings or proximity to no-fishing zones, providing a visual cue for fishers without smartphones. Initial deployments in Cox's Bazar reduced fishing accidents by 32% and increased average daily catch by 15% due to more efficient targeting of productive areas. The modular design allows rapid relocation of buoys in response to seasonal changes, ensuring adaptability to shifting marine conditions.

BD.4.

Inventors: Fahim Rashid

Invention	Floating Microgrid Platform for Remote River Communities
Institution	-
Abstract	Thousands of households in riverine islands, known as chars, remain disconnected from the national electricity grid due to shifting river channels. RiverGrid introduces a floating microgrid platform combining solar panels, battery storage, and a compact diesel backup generator for reliability. The platform anchors in shallow water near target communities, delivering power via lightweight, insulated cables suspended over short spans. Energy distribution is managed by a smart load-balancing controller that prioritizes lighting, refrigeration for medicines, and mobile phone charging. RiverGrid can be towed to new locations when seasonal flooding reshapes the river landscape, ensuring continuity of service. Trials in Gaibandha district provided uninterrupted electricity to 56 households and three community facilities over six months, demonstrating resilience against environmental disruptions.
BD.5.	
Inventors	Tasnim Faria, Imran Majid, Zubair Rafi, Rubina Khalique, Mahir Chowdhury, Tahsin Ahmed, Lamiya Sultana, Maruf Hossain
Invention	CoolRoof+
Institution	Sylhet Urban Climate Adaptation Group
Abstract	Urban heat in Bangladesh's densely populated cities can raise rooftop temperatures beyond 60°C during summer, intensifying cooling costs and discomfort. CoolRoof+ combines a reflective ceramic coating with a moisture-retentive underlayer made from recycled jute fibers. The upper layer reflects over 85% of incoming solar radiation, while the jute underlayer absorbs and slowly evaporates water collected from rooftop rainwater systems, creating an evaporative cooling effect. This dual-action system reduced indoor temperatures by up to 6°C during midday in pilot installations in Sylhet, without reliance on electricity. The materials are locally sourced, affordable, and compatible with existing flat-roof structures. The design also extends roof lifespan by minimizing thermal expansion and contraction cycles, providing both economic and environmental benefits.

BELGIUM

BE.1.	
Inventors	Maelle Verbruggen, Thibault Lemaire, Sören Vandevelde
Invention	On-Demand Metal Component Recycling for Urban Makerspaces
Institution	Flanders Circular Manufacturing
Abstract	In dense urban centers, small-scale manufacturing hubs and makerspaces often rely on costly, imported metal feedstock while discarding significant volumes of unusable scrap. RePrint Alloy introduces a compact, modular recycling unit capable of converting mixed non-ferrous metal waste into high-quality, printable wire feedstock for 3D metal printers. The system employs an induction-based melting chamber paired with a precision alloying station that adds trace elements to restore structural integrity. A proprietary filtration method removes contaminants such as paint, oxidation, and embedded fasteners, producing wire with mechanical properties comparable to virgin stock. Operable on a standard three-phase power supply, the unit is sized to fit into a small workshop and can process up to 40 kilograms of scrap per day. Trials in Brussels makerspaces demonstrated that integrating RePrint Alloy reduced raw material costs by 37% and diverted over 4 tonnes of metal waste from landfill within six months. The machine's open-source control software allows customization of alloy compositions, enabling users to tailor materials for specific projects. This invention not only strengthens local manufacturing resilience but also aligns with Belgium's broader circular economy goals, bridging the gap between grassroots innovation and sustainable industrial practice.

BULGARIA

BG.1.

Inventors: Milena Dragomirova, Plamen Kostov, Veselina Chobanova
Invention: Integrated Pest Defense for Mountain Apiaries
Institution: -
Abstract: Beekeeping in mountainous regions faces threats from both environmental stressors and invasive species such as the Asian hornet. HiveGuard is a combined physical and sensor-based defense system designed to protect hives while minimizing beekeeper intervention. The unit consists of a lightweight, mesh-framed tunnel entrance embedded with motion and vibration sensors capable of distinguishing between honeybee and predator activity. Upon detecting a threat, HiveGuard activates a brief ultrasonic pulse coupled with a harmless gust of compressed air to deter the predator. Data from each unit is sent to a cloud dashboard, allowing beekeepers to monitor hive activity remotely and receive alerts in case of prolonged disturbances or hive inactivity. Trials in the Rhodope Mountains showed an 82% reduction in hornet intrusion events and a measurable increase in winter hive survival rates. By combining automated deterrence with data-driven insights, HiveGuard supports sustainable apiculture while reducing reliance on chemical repellents that can affect bee health.

BG.2.

Inventors: Borislav Yanev
Invention: StepWave
Institution:
Abstract: Urban areas face rising energy demands for street lighting and public infrastructure, while many pedestrian-heavy zones remain underutilized as potential energy sources. StepWave is a modular pavement system that converts kinetic energy from foot traffic into usable electricity. Each tile incorporates a low-profile piezoelectric array sandwiched between impact-resistant polymer layers. When stepped on, the tile generates an electric charge that is captured and stored in an underground capacitor bank. The stored energy powers nearby LED streetlights, public charging ports, and environmental monitoring sensors. A microcontroller regulates energy distribution based on real-time demand, ensuring efficient use of harvested power. Pilot installations in Sofia's city center generated enough electricity to power 12 LED streetlights for eight hours each night, while also collecting valuable foot traffic data for urban planning. StepWave tiles are designed for quick installation and replacement, making them a scalable option for municipalities seeking to integrate renewable microgeneration into public infrastructure.

CAMBODIA

KH.1.

Inventors: Sovanna Meas, Dara Vichea
Invention: Micro-Hydro Turbine for Floating Villages
Institution: Cambodia Inventors academy
Abstract: Floating communities along the Tonlé Sap Lake rely heavily on diesel generators for electricity, which are expensive and polluting. RiverSpin is a low-profile micro-hydro turbine designed for slow-moving river and lake currents. The unit uses a helical blade assembly enclosed in a protective cage to prevent damage from debris and aquatic life. It is tethered beneath floating structures, silently generating up to 600 watts in currents as low as 1.5 meters per second. The power output is stored in a waterproof battery module, capable of running LED lighting, small appliances, or mobile charging stations. Field trials in Kampong Chhnang showed a 54% reduction in fuel costs for participating households and an average of eight hours of reliable electricity per day. RiverSpin's modular design allows easy scaling, from individual homes to community-level installations, without requiring large infrastructure investments.

KH.2.	
Inventors	Lida Prum, Channary Thach, Sokchea Ngeth, Piseth Khem, Monita Sieng
Invention	Passive Cooling Panels for Low-Income Housing
Institution	Cambodia Inventors academy
Abstract	BambooTherm leverages locally abundant bamboo to create passive cooling panels that can be mounted on roofs and walls. The bamboo is split, boiled, and treated with a natural mineral coating that increases reflectivity and prevents insect damage. Inside each panel, a layered airflow channel design promotes convection, drawing heat away from the building. Tests on prototype homes in Phnom Penh recorded indoor temperature reductions of 4–6°C without electricity. Production can be done in rural workshops using basic tools, providing both environmental and economic benefits.
KH.3.	
Inventors	Sophea Chhim, Kimleng Vorn, Sareth Chao
Invention	ClayClear
Institution	Cambodia Inventors academy
Abstract	Rural communities often depend on contaminated surface water, leading to high rates of waterborne disease. ClayClear combines traditional ceramic filtration with biochar infusion, enhancing the adsorption of heavy metals and pesticides. Locally sourced clay is mixed with sawdust and finely ground biochar, then kiln-fired to create porous filters. Laboratory tests demonstrated a 99.2% reduction in E. coli and significant removal of arsenic, a common contaminant in certain Cambodian groundwater sources. Each filter can process up to 30 liters per day and lasts for one year before replacement.
KH.4.	
Inventors	Vannak Sou, Chenda Meak
Invention	RiceStalk
Institution	Cambodia Inventors academy
Abstract	Millions of tonnes of rice stalks are burned each year, contributing to air pollution and greenhouse gas emissions. RiceStalk Press is a pedal-powered machine that compresses shredded rice stalks into dense briquettes for use in clean-burning stoves. The system's mechanical advantage allows continuous operation without electricity, producing up to 80 briquettes per hour. Adoption in Battambang reduced open-field burning by 40% in participating villages, while providing a new income source for farmers.
KH.5.	
Inventors	Somnang Vichea
Invention	Buoyant Crop Beds
Institution	Cambodia Inventors academy
Abstract	Seasonal flooding in Cambodia often destroys crops before harvest. AquaFloat uses lightweight, buoyant frames constructed from recycled plastic drums and bamboo, topped with soil-filled mesh trays. Crops such as leafy greens and herbs can grow above fluctuating water levels, reducing loss risk. In pilot programs along the Mekong Delta, AquaFloat systems sustained yields during a two-week flood period when traditional fields were submerged.
KH.6.	
Inventors	Pisey Chan, Monorom Keo
Invention	FishTrack
Institution	Cambodia Inventors academy
Abstract	Overfishing threatens the biodiversity freshwater ecosystems. FishTrack deploys small, biodegradable acoustic tags that transmit movement and population data for key fish species. Receivers along migration routes feed information to a central database, enabling better regulation of fishing seasons and quotas. Trials reduced illegal catch incidents by 23% and improved spawning success for targeted species.
KH.7.	

Inventors	Leakena Hor, Vuthy Tep, Sela Nem
Invention	Compost-Producing Community Garden Units
Institution	Cambodia Inventors academy
Abstract	Organic waste is often dumped in landfills, generating methane emissions. TrashBloom is a vertical garden structure with an integrated composting core. Residents deposit food scraps into the core, where microbial action converts waste into nutrient-rich soil for surrounding planters. A small solar-powered fan accelerates decomposition. In pilot districts, TrashBloom reduced household waste by 18% and provided fresh herbs and vegetables for residents.
KH.8.	
Inventors	Sopheap Eang, Rina Chhay
Invention	MotoVolt
Institution	Cambodia Inventors academy
Abstract	Motorbikes are primary transport mode but a major source of emissions. MotoVolt is a retrofit kit replacing the petrol engine with a brushless electric motor, battery pack, and regenerative braking system. The kit fits common models without welding or frame alteration. In Phnom Penh tests, converted bikes achieved 85 km range per charge at one-tenth the operating cost of petrol.
KH.9.	
Inventors	Sothea Kim, Chansophea Houn, Phirun Nov, Chantrea Nuon
Invention	LightLoom
Institution	Cambodia Inventors academy
Abstract	Tourism festivals in Siem Reap require extensive temporary lighting, often powered by noisy diesel generators. LightLoom integrates thin-film solar cells into traditional silk lanterns, storing power in lightweight battery strips woven into the fabric frame. Lanterns operate for up to 10 hours, providing warm, flicker-free illumination without harming the visual authenticity of heritage sites.
KH.10.	
Inventors	Kimhouy Norn, Vichet Theam, Anyka Peou
Invention	MedBoat
Institution	Cambodia Inventors academy
Abstract	Remote river communities often lack year-round medical access. MedBoat is a solar-powered catamaran fitted with telemedicine equipment, refrigeration for vaccines, and a small diagnostic lab. Patients connect with doctors via satellite link, enabling real-time consultation and diagnosis. The boat's modular clinic cabin can be detached and set up onshore in emergencies.
KH.11.	
Inventors	Sokun Thy
Invention	Drone-Based Structural Analysis for Ancient Temples
Institution	Cambodia Inventors academy
Abstract	Conservation of Angkor's stone temples is hindered by inaccessible areas and delicate structures. StoneScan is a drone equipped with multi-spectral imaging and 3D LiDAR to detect cracks, water intrusion, and biological growth. Data is processed into detailed restoration maps, reducing the need for invasive inspections.
KH.12.	
Inventors	Borey Um, Pichmony Pao, Chamroeun Ny, Sreynich Mao, Darith Bun, Vichea Lun
Invention	ShadeWave
Institution	Cambodia Inventors academy
Abstract	Public spaces often lack shade, discouraging outdoor activity during hot months. ShadeWave uses tensioned fabric panels mounted on telescopic poles that retract automatically during storms or high winds. Solar-powered actuators control deployment, and integrated rain channels collect water for nearby gardens.

KH.13.	
Inventors	Sotheary Khun, Rith Mon
Invention	Off-Grid Timber Drying Facility
Institution	Cambodia Inventors academy
Abstract	Wood processing industries often depend on fossil-fuel kilns. SolarKiln uses a greenhouse-style enclosure with black heat-absorbing panels and adjustable ventilation to control drying rates. The design reduces drying time for tropical hardwoods by 40% while eliminating fuel costs, improving profitability for rural sawmills.

CAMEROON

CM.1.	
Inventors	Clarisse Nkomo, Jules Ewan, Rodrigue Tchami, Mireille Fouda
Invention	Solar Powered Cocoa Fermentation Chamber
Institution	Central African Agro-Technology Research Network
Abstract	Coca industry often struggles with inconsistent fermentation quality due to variable weather conditions and the reliance on open-air methods. This can lead to uneven flavor profiles, lower market value, and increased spoilage. The Solar-Powered Cocoa Fermentation Chamber is a self-contained unit designed to provide optimal temperature and humidity control throughout the entire fermentation cycle, using only renewable energy. The chamber is built with locally sourced timber for structural framing and insulated panels made from compressed agricultural residues, which minimize heat loss. A rooftop solar array powers low-energy fans and a humidity regulation system that maintains precise environmental conditions. Embedded temperature sensors provide real-time data to a mobile application, enabling farmers to track progress and make adjustments without physically opening the chamber and risking contamination. In field tests in the Centre and Littoral regions, beans fermented in the chamber consistently achieved the premium-grade classification, fetching up to 22% higher prices in export markets. The controlled process also shortened fermentation time by nearly a full day compared to traditional methods, allowing more harvest cycles per season. By combining renewable energy, local materials, and digital monitoring, this invention offers smallholder farmers a scalable path to higher incomes and more consistent product quality, while reducing post-harvest losses and environmental impact.

CANADA

CA.1.	
Inventors	Armin Fakhri
Invention	Arctic Modular Greenhouse Network
Institution	-
Abstract	Northern communities face high food costs and limited access to fresh produce due to long transportation routes. The Arctic Modular Greenhouse Network is a prefabricated growing system built for subzero environments, using insulated wall panels, triple-glazed windows, and an internal thermal battery that stores excess daytime heat for nighttime use. Each unit is equipped with adaptive LED grow lights and a closed-loop hydroponic system requiring 90% less water than traditional agriculture. Designed for rapid assembly, the modules can be connected to form larger growing spaces as community needs expand. Pilot programs in Nunavut demonstrated a 42% reduction in produce imports, while surplus harvests generated local income.
CA.2.	
Inventors	Yvette Tremblay, Wei Lian, Li Ming, Sophie Beaulieu, Olivia MacNeil
Invention	Wave-Driven Bio-Plastic Pelletizer
Institution	Renewable Materials Lab
Abstract	Marine plastic pollution is a pressing issue along Pacific coastline. The Wave-Driven Bio-Plastic Pelletizer uses nearshore wave energy to power a rotary shredder and extrusion

	system that transforms collected ocean plastic waste into uniform pellets for remanufacturing. The device is anchored offshore with a floating intake barrier that channels debris into the shredder chamber. The extrusion process blends shredded waste with biodegradable binders, producing pellets compatible with standard plastic molding machinery. Trials in British Columbia processed up to 1.2 tonnes of marine waste per week, creating a profitable raw material stream for local industries.
CA.3.	
Inventors	Ethan McAllister, Zhang Rui, Amelie Chen
Invention	Avalanche Detection Micro Radar Grid
Institution	Canadian Alpine Safety Engineering Group
Abstract	Ski resorts and mountain highways face annual avalanche risks. The Avalanche Detection Micro-Radar Grid is a network of low-power radar sensors embedded along known avalanche paths. These units continuously scan snowpack density and micro-movements, transmitting data to a centralized AI platform that predicts high-risk events up to 45 minutes before occurrence. Field testing in British Columbia and Alberta improved evacuation and closure response times by 30%, reducing risk to both recreational visitors and transportation crews.
CA.4.	
Inventors	Reza Mahdavi
Invention	Algae Biofuel Platform
Institution	-
Abstract	Excess nutrient runoff in the Great Lakes causes algae blooms that threaten ecosystems and water quality. The Floating Algae Biofuel Platform deploys anchored barges equipped with surface skimming systems and enclosed cultivation tanks. Collected algae is processed onboard into biofuel feedstock, while the remaining biomass is converted into agricultural fertilizer. The system operates year-round, with winter heating powered by a combination of solar panels and micro wind turbines. Pilot operations on Lake Erie produced 15,000 liters of biofuel equivalent in a single season while improving water clarity in test zones.
CA.5.	
Inventors	Jing Xiu, Morgan Pelletier
Invention	Adaptive Snow-Melt Roadway System
Institution	-
Abstract	Snow and ice removal in Canadian cities is costly and environmentally damaging due to salt usage. The Adaptive Snow-Melt Roadway System integrates embedded hydronic tubing beneath road surfaces, circulating a biodegradable heat-transfer fluid warmed by geothermal exchangers and waste industrial heat. Smart controls prioritize high-traffic intersections and pedestrian crossings. Trials in Montreal reduced salt use by 65% and eliminated ice-related accidents at monitored sites during a full winter season.
CA.6.	
Inventors	Connor Hughes, Wu Meilin, Gabrielle Boucher
Invention	Drone deployed Ember Suppression Pods
Institution	Boreal Wildfire Management Technology Center
Abstract	Wildfires boreal forests often spread through airborne embers that ignite new hotspots far from the main fire. This system uses autonomous drones to deploy biodegradable suppression pods filled with fire-retardant gel into predicted ember landing zones. The gel is plant-safe, moisture-retentive, and remains effective for up to 48 hours. During 2024 tests in northern Ontario, the system contained 87% of secondary fire outbreaks within designated buffer zones, providing firefighters with a strategic advantage.
CA.7.	
Inventors	Lucas Fortin
Invention	Hybrid Ice road Logistics Vehicle

Institution	-
Abstract	Remote northern regions depend on temporary ice roads for supply delivery, but vehicle emissions and weight can compromise ice integrity. The Hybrid Ice-Road Logistics Vehicle combines a lightweight aluminum chassis with a dual electric-diesel drive. The vehicle automatically switches to electric mode on thinner ice to reduce weight load and vibration stress. It also incorporates real-time ice-thickness sensors that alert operators to unsafe conditions. Field operations in the Northwest Territories extended the usable ice-road season by an average of eight days while reducing fuel consumption by 38%.

CHILE

CL.1.	
Inventors	Valeria Cortés, Ignacio Paredes
Invention	Desalination Dome
Institution	-
Abstract	Coastal communities arid northern regions face chronic water shortages despite proximity to the Pacific Ocean. The Solar-Powered Desalination Dome is a scalable, low-maintenance structure that converts seawater into fresh water using only solar energy. The dome is constructed from transparent, UV-resistant panels that concentrate sunlight onto a black evaporation basin. As seawater evaporates, the vapor condenses on the interior surface of the dome and runs down into collection channels, yielding potable water without chemical additives. Integrated thermal storage materials retain heat after sunset, extending production into the night. In pilot installations near Antofagasta, a single 8-meter-diameter dome produced an average of 1,200 liters of drinking water per day, supplying over 50 households. The modular design allows domes to be installed individually for small villages or in clusters for municipal-scale operations. Its reliance on locally available materials and absence of complex mechanical parts make it well-suited for long-term deployment in remote, off-grid locations, supporting both human consumption and small-scale agriculture.

CHINA

CN.1.	
Inventors	Li Xinyu, Chen Yufei, Wang Zemin
Invention	Canal Cover System
Institution	Pearl River Smart Water Research Institute
Abstract	China's extensive irrigation canal networks lose significant volumes of water annually through evaporation, especially in arid northern provinces. The Floating Solar Canal Cover System consists of interlocking solar panel rafts that both shade the water surface and generate electricity for nearby agricultural operations. The modular panels are built from lightweight corrosion-resistant aluminum frames with anti-slip walkways for maintenance access. This dual-purpose approach reduces evaporation by up to 72% while generating 35–50 kWh per panel per month under typical southern China sunlight conditions. A pilot installation in Guangdong supplied power for automated pumping stations and drip irrigation systems, creating a closed-loop water-energy cycle that benefits farmers and reduces carbon emissions.
CN.2.	
Inventors	Zhang Hui, Luo Ming, Sun Yawei, Qian Jing
Invention	Rooftop Biofilm Smog Filter
Institution	Yangtze Urban Air Quality Innovation Lab
Abstract	Air pollution remains a challenge in many metropolitan areas. The Rooftop Biofilm Smog Filter is a vertical garden system integrated with a thin-layer biofilm that captures and metabolizes airborne particulates and nitrogen oxides. The biofilm, composed of microalgae and naturally occurring bacteria, is contained within modular wall-mounted panels connected to a low-energy misting system for nutrient supply. Buildings equipped

	with the system in Nanjing recorded a 31% reduction in PM2.5 levels within their immediate surroundings over a three-month trial period. The panels also act as thermal insulation, lowering building cooling costs in summer.
CN.3.	
Inventors	Wu Min, Zhao Wenli, Tang Ziqi
Invention	Self Healing Concrete for Earthquake Prone Infrastructure
Institution	Sichuan Seismic Resilience Engineering Center
Abstract	This Self-Healing Concrete incorporates encapsulated calcium carbonate-producing bacteria that activate upon contact with water entering cracks. Once triggered, the bacteria produce mineral deposits that seal the gaps, restoring structural integrity without human intervention. Field tests on bridge supports in Ya'an demonstrated crack closure within 14 days and improved water impermeability by 60% compared to untreated concrete. The material can be mixed using existing batching plant equipment, enabling immediate adoption in both new construction and repair projects.
CN.4.	
Inventors	Lin Qiaomei, He Xun, Guo Fang, Shen Lijun
Invention	Autonomous Orchard Pruning Drone
Institution	Shandong Agricultural Robotics Consortium
Abstract	Fruit growing regions face labor shortages during pruning season, impacting yield quality. The Autonomous Orchard Pruning Drone uses multi-spectral imaging to identify branches that require trimming for optimal sunlight penetration and air circulation. Equipped with robotic arms and precision cutting tools, the drone can navigate dense canopies without damaging fruit. Real-time AI processing allows for adaptive pruning strategies based on tree health indicators. In Shandong apple orchards, deployment of the drone reduced manual labor costs by 45% and increased overall fruit quality ratings in export inspections. The drone's modular design allows attachment swaps for other agricultural tasks, such as targeted spraying or blossom thinning.

DENMARK

DK.1.	
Inventors	Mette Sørensen
Invention	Tidal Powered Coastal Battery Array
Institution	Nordic Offshore Sustainability Consortium
Abstract	Coastal communities are increasingly seeking renewable energy options that complement existing wind infrastructure. The Tidal-Powered Coastal Battery Array is a series of compact tidal turbines anchored near breakwaters, paired with onshore battery banks for storing the generated electricity. Each turbine operates at low rotational speeds to minimize harm to marine life while still producing consistent output from even modest tidal flows. The onshore batteries use advanced lithium-titanate chemistry, enabling rapid charge–discharge cycles and an operational lifespan exceeding 20 years. In a pilot project near Esbjerg, the array powered harbor lighting, cold storage facilities for fisheries, and electric vehicle charging stations entirely from tidal energy for three consecutive months. The modular nature of the system allows incremental expansion as community demand grows, making it ideal for decentralized coastal energy independence.

ECUADOR

DK.1.	
Inventors	Camila Cárdenas, Diego Montalvo, Rafael Yánez
Invention	Coffee Dryer
Institution	Andean Highlands High School
Abstract	Highland coffee-growing regions, unpredictable rainfall and fluctuating temperatures often disrupt the drying process, affecting flavor quality and export value. The Solar-Geothermal Hybrid Coffee Dryer combines two renewable energy sources to ensure consistent, low-

	temperature drying regardless of weather. The system uses an array of angled solar thermal collectors to preheat air during the day, supplemented by geothermal heat drawn from shallow underground piping that maintains a steady baseline temperature. A humidity-regulated airflow system directs warm air through stacked drying racks, preserving delicate flavor compounds. Pilot installations in Loja Province reduced drying time by 38% compared to traditional patio drying, while producing beans with higher uniformity scores in cupping tests. The hybrid approach not only improves quality but also reduces post-harvest losses and allows farmers to process larger volumes during peak harvest without relying on fossil-fuel heaters.

EGYPT

EG.1.	
Inventors	Eyad Hassanein Sami Hassanein, Ibrahim Saleh Reda Mokhtar, Mahmoud Mohamed ElKady, Adam Mohamed Fawzy, Farida Mohamed Fawzy AbdelAzim
Invention	Smart System for Rainwater Monitoring and Automatic Drainage Control
Institution	Science academy
Abstract	This project presents a smart solution to reduce urban flooding using low-cost technologies such as Arduino, water level sensors, and automatic drainage systems. It aims to collect rainwater and store it in large underground tanks or behind small dams, then reuse it during drought periods, supporting sustainability and water resource management.
EG.2.	
Inventors	Mohamed Osama
Invention	Eco Sorter
Institution	Science academy
Abstract	The waste detection robot is an environmentally friendly robot. The device was designed to help the environment eliminate waste and pollution and solve the global problem of climate change. The robot can distinguish between metal and plastic waste, then grasp it using a hand controlled by a mobile phone. It then collects it in designated locations. The robot then recycles the plastic waste by manufacturing plastic filaments used in 3D printers, which also offer high printing quality.
EG.3.	
Inventors	Salem Magdy Al-Sharqawi, Retal Abdullah Al Wakeel
Invention	NutriMate
Institution	Science academy
Abstract	NutriMate is a mobile application designed to promote healthier lifestyles by providing personalized nutrition and fitness tracking. The system helps users monitor their daily calorie intake, track physical activities, and set health-related goals such as weight management or dietary improvement. NutriMate integrates features such as a meal planner, exercise tracker, and progress visualization dashboard, all presented in a simple and interactive user interface. By combining user-provided data (age, height, weight, and fitness goals) with nutritional guidelines, the application calculates daily caloric needs and provides real-time feedback on consumption and remaining allowances. Additionally, it supports motivational progress tracking and personalized recommendations to enhance user engagement. The goal of NutriMate is to empower individuals to make informed lifestyle decisions, achieve their health objectives, and maintain long-term wellness through an intelligent, easy-to-use platform.
EG.4.	
Inventors	Eyad Hasanin Sami Hasanin, Al Taher Ahmed Al Taher Elkholy
Invention	EduPredict
Institution	Science academy
Abstract	This project analyzes student performance data to identify the key factors influencing academic success. A pass/fail column was created based on the final grade (G3). Using statistics and visualizations, the study explores how study time, absences, gender, and family support affect

outcomes. The results show that greater study time and strong family support are linked to better performance, while excessive absences reduce success. The analysis highlights the importance of lifestyle and social factors in shaping student achievement.

EG.5.

Inventors	Seif Abdelmoneim Goda, Mohamed Hatem Abdel Nabi , Mazen Mohammed Abdul-Mawla Mubarak
Invention	WellNest
Institution	Science academy
Abstract	WellNest is a comprehensive digital healthcare platform designed to enhance accessibility, efficiency, and patient engagement in modern medical services. The platform provides users with the ability to search and connect with doctors, book appointments seamlessly, manage personal health records, and receive instant medical advice through an integrated chatbot. Developed with HTML, CSS, and JavaScript, WellNest incorporates advanced design principles including responsive layouts, CSS animations, and dynamic JavaScript features to deliver an intuitive and interactive user experience. Local storage is employed to maintain essential user data such as appointments and medical history, ensuring continuity across sessions. The system is structured into modular pages—covering the landing page, authentication, doctor directory, appointment scheduling, health record management, and live consultation—creating a clear and user-friendly navigation flow. With its scalable design, WellNest lays the foundation for future integration of databases, AI-driven diagnostics, and telemedicine APIs, making it a practical step toward digital transformation in healthcare.

ESTONIA

EE.1.

Inventors	Kristjan Saar, Maarja Pärn, Toomas Vaher
Invention	Self-Adjusting Ice-Resistant Port Docking System
Institution	Baltic Smart Mobility Innovation Centre
Abstract	Baltic Sea ports face seasonal challenges from drifting ice and fluctuating water levels, which can damage docking structures and delay shipping schedules. The Self-Adjusting Ice-Resistant Port Docking System uses a floating platform design with reinforced composite fenders and an automated mooring mechanism. Hydraulic cylinders adjust the platform's height in real time based on tidal data and ship displacement, while a low-friction ice-shedding coating prevents accumulation on contact surfaces. Integrated sensors monitor structural stress and environmental conditions, sending predictive maintenance alerts to port operators. In trials at the Port of Tallinn, the system reduced winter docking delays by 43% and extended equipment lifespan by an estimated 12 years. The design's modular configuration allows for phased upgrades at existing piers without halting operations, making it a cost-effective modernization solution for small and large ports alike.

FINLAND

FI.1.

Inventors	Aino Korpela, Mikko Laaksonen, Salla Väisänen, Emilia Salonen, Tapio Niemi
Invention	Snow-Integrated System
Institution	-
Abstract	Rooftop snow accumulation often blocks solar panels, reducing energy output. The Snow-Integrated Solar Thermal Roof System combines photovoltaic cells with embedded micro-thermal tubing that uses a fraction of generated electricity to circulate warm glycol beneath the panel surface. This gently melts snow while capturing thermal energy for domestic heating. The system operates automatically, activating only when snow weight exceeds safe

	limits or when solar yield is compromised. Field trials in Rovaniemi demonstrated up to 18% higher annual energy production compared to conventional panels, along with reduced structural stress from snow loads. Its modular panel format allows seamless integration into both residential and commercial rooftops without major architectural changes.
FI.2.	
Inventors	Juhani Lehtinen
Invention	Autonomous Replanting Rover for Boreal Forests
Institution	-
Abstract	Reforestation boreal regions is labor-intensive and slowed by challenging terrain. The Autonomous Replanting Rover uses GPS mapping, terrain-adaptive tracks, and AI-driven planting arms to place saplings at optimal intervals and depths. It carries a seedling tray system capable of holding up to 1,200 plants, automatically refilling from mobile supply depots. The rover also records soil pH, moisture, and nutrient data at each planting site, feeding into a central forestry database to guide future management decisions. In pilot programs across Lapland, the rover planted up to 2.3 hectares per day with a 92% sapling survival rate after six months. Its rugged design and autonomous navigation allow it to operate in remote forests with minimal human supervision, accelerating Finland's reforestation goals and supporting sustainable timber production.

FRANCE

FR.1.	
Inventors	Camille Dubois
Invention	Tidal Microgrid for Island Communities
Institution	-
Abstract	The Tidal Microgrid for Island Communities integrates compact horizontal-axis turbines into natural tidal channels, connected to a shoreline microgrid with battery storage. The system operates silently, with slow-moving blades designed to avoid harm to marine life. Real-time energy management software prioritizes essential services such as medical refrigeration and water desalination, ensuring continuity during peak demand. Pilot deployment near Îles du Frioul cut diesel fuel use by 68% and provided stable 24/7 power for both residents and tourism infrastructure. The modular turbine units can be installed or relocated without heavy marine construction, making the solution adaptable to seasonal energy needs.
FR.2.	
Inventors	Julien Morel, Nour Al-Hakim, Chloé Bernard, Adrien Lefèvre, Sophie Garnier
Invention	Living Facade for Pollution Absorption
Institution	-
Abstract	The Living Facade for Pollution Absorption is a vertical biofilter system mounted on building exteriors, using a layered structure of mosses, ferns, and activated carbon panels. Air is drawn through the facade using low-energy fans powered by rooftop solar arrays. The moss layer captures fine particulate matter, while the activated carbon absorbs nitrogen oxides and volatile organic compounds. A closed-loop irrigation system uses collected rainwater, minimizing maintenance requirements. Trials on a 12-story building in the 13th arrondissement reduced adjacent street-level PM2.5 concentrations by 19% and improved thermal insulation by 8%, contributing to lower cooling costs in summer.
FR.3.	
Inventors	Élodie Marchand, Pierre Fournier, Lucie Carpentier
Invention	AI-Guided Vineyard Drone Swarm
Institution	-
Abstract	The AI-Guided Vineyard Drone Swarm consists of lightweight autonomous drones equipped with hyperspectral cameras and micro-sprayers. The system scans vine rows for

	early signs of disease, nutrient deficiency, or pest activity, enabling targeted treatment rather than broad chemical application. In field trials in the Loire Valley, the swarm reduced pesticide use by 42% while increasing average grape quality scores in winery tests. The drones operate cooperatively, sharing mapping data to cover large estates quickly and without overlapping efforts. Each unit is designed to be easily repairable in local workshops, making the system accessible to mid-sized vineyards without reliance on expensive proprietary servicing.

GREECE

GR.1.	
Inventors	Nikos Papadakis, Eleni Kouris
Invention	Wave-Powered
Institution	-
Abstract	The Wave-Powered harnesses nearshore wave energy through a point-absorber buoy system connected to a land-based reverse osmosis plant. The mechanical motion of the buoys drives high-pressure pumps directly, eliminating the need for electrical conversion and reducing operational costs. The system operates continuously, with excess production stored in covered reservoirs to prevent evaporation. A pilot unit on the island of Naxos produced an average of 18,000 liters of fresh water per day, enough to meet the peak needs of a small village while cutting energy-related emissions to zero. Its modular design allows rapid scaling for larger communities or resorts, and its low visual profile ensures minimal impact on coastal aesthetics, preserving the tourism appeal of the shoreline.

HONG KONG

HK.1.	
Inventors	Adrian Leung, Chloe Wong, Matthew Cheng
Invention	Seawall Power System
Institution	Harbour Renewable Energy Research Centre
Abstract	The Tidal-Integrated Seawall Power System embeds low-profile horizontal turbines within seawall openings, harnessing tidal flows without disrupting marine navigation. Each turbine is paired with a microgrid battery bank that powers nearby public lighting and electric ferry charging points. During a six-month trial at Victoria Harbour, the system generated an average of 145 MWh, enough to power over 500 streetlights, while reducing emissions associated with grid electricity. Its design blends seamlessly into existing infrastructure, avoiding the need for large-scale construction projects.
HK.2.	
Inventors	Tiffany Ng, Henry Lau
Invention	Reflective Green Roof Cooling Network
Institution	Harbour Renewable Energy Research Centre
Abstract	Urban heat islands in dense districts raise cooling costs and impact public health. The Reflective Green Roof Cooling Network combines high-albedo tiles with shallow-rooted greenery on interconnected rooftops. Integrated sensors monitor temperature and humidity, sharing real-time cooling performance data with a citywide platform. This network effect amplifies cooling efficiency across multiple buildings. In trials in Mong Kok, the system lowered peak rooftop temperatures by 11°C and reduced indoor cooling energy use by 22% in participating structures.
HK.3.	
Inventors	Kelvin Poon, Karen Chan, Victor Ho, Jason Fok
Invention	Modular Autonomous Tram Pods
Institution	Harbour Renewable Energy Research Centre

Abstract	Building iconic tram network, Modular Autonomous Tram Pods are small, battery-powered units that can connect or disconnect to match passenger demand. Each pod is equipped with independent motors, LiDAR navigation, and magnetic couplings for seamless linking. When demand is low, pods operate individually; during peak hours, they combine to form longer trains. A pilot on a 2 km section in Central reduced wait times by 35% and cut operational energy use by 18%.
HK.4.	
Inventors	Sylvia Yip, Lucas Kwok, Michelle Tang, , Natalie Lam
Invention	Autonomous Ferry Emissions Scrubber
Institution	-
Abstract	Harbour ferries contribute significantly to localized air pollution. The Autonomous Ferry Emissions Scrubber mounts directly onto ferry exhaust outlets, filtering particulates and nitrogen oxides through a water-based scrubber system. The unit operates automatically, flushing and recycling the scrubbing water using onboard solar power. Tests on Star Ferry vessels achieved a 74% reduction in particulate emissions, improving air quality along heavily trafficked ferry routes.
HK.5.	
Inventors	Darren Cheung, , Raymond Chiu
Invention	Rapid-Deploy Flood Barrier Mat
Institution	Kowloon Resilience Group
Abstract	Flash floods from heavy rainstorms can inundate streets in minutes. The Rapid-Deploy Flood Barrier Mat is a roll-out mat embedded with inflatable bladders that automatically fill with water when submerged, creating an instant barrier. Stored in curbside compartments, the mats deploy in under two minutes and can be reused after cleaning. Field use in Sham Shui Po prevented water ingress into 18 street-level shops during a simulated flood drill.
HK.6.	
Inventors	Alex Tsang
Invention	Vertical Waste Compression Shaft
Institution	-
Abstract	Managing waste in high-rise residential towers is a logistical challenge. The Vertical Waste Compression Shaft integrates a compactor into the building's refuse chute, compressing waste into dense blocks before reaching ground level. This reduces collection frequency and truck trips by up to 40%. A pilot in a 30-story building in Tsim Sha Tsui cut waste transport costs for residents' associations by 28% while improving hygiene in collection rooms.
HK.7.	
Inventors	Grace Fong, Samuel Yuen, Iris Mak, Gordon Lee, Anthony Pang, Carmen Wong, Felix Chan, Kenneth Ip
Invention	Real-Time High-Rise Evacuation Guidance System
Institution	Hong Kong Harbour Robotics Alliance
Abstract	High-rise evacuations during fires or earthquakes can be chaotic. The Real-Time High-Rise Evacuation Guidance System uses dynamic LED floor strips and wall panels that adapt route instructions based on fire and smoke sensor data. Integrated with building management systems, it can reroute occupants away from blocked exits in real time. Tests in a 45-story office tower reduced full evacuation time by 21% and improved compliance with safe exit routes.

ICELAND

IS.1.

Inventors	Einar Sigurðsson, Freyja Björnsdóttir
Invention	Seaweed Drying Facility
Institution	-
Abstract	By using geothermal energy instead of fossil fuels, operational costs are reduced by over 60%, and carbon emissions are virtually eliminated. A pilot plant in the Westfjords processed 15 tonnes of seaweed in its first season, producing a consistent, high-quality product suitable for food, cosmetic, and bio-packaging industries. Its scalable modular design allows deployment in small fishing towns as well as larger commercial hubs, creating new income streams while leveraging Iceland's abundant renewable resources.

INDIA

IN.1.

Inventors	Arjun Malhotra, Kavya Nair, Rohit Deshmukh, Meera Iyer, Aniket Sinha, Harpreet Bawa
Invention	Modular Bridge Kit
Institution	-
Abstract	The All-Terrain Modular Bridge Kit is a lightweight, portable bridge system made from high-strength aluminum alloy and fiber-reinforced panels. Each module can be hand-carried by small teams and assembled without heavy machinery.

IN.2.

Inventors	Priya Kulkarni, Devansh Mehta, Suresh Kumar, Neha Kapoor, Raghav Banerjee, Manoj Pillai
Invention	Pollution Capture System
Institution	-
Abstract	The first stage uses low-energy charged plates to capture PM2.5 and PM10 particles, while the second stage passes air through a moss-based biofilter that metabolizes nitrogen oxides and volatile organic compounds.

INDONESIA

ID.1.

Inventors	Rizky Pratama, Ayu Maharani, Bagus Setiawan, Dwi Santoso, Maya Kartika, Arif Nugroho
Invention	Mangrove Restoration
Institution	IYSC Jakarta
Abstract	The Floating Mangrove Restoration Platform is a modular raft system designed to germinate and nurture mangrove seedlings in sheltered offshore waters before transplantation. Each raft contains nutrient-infused soil pods anchored in biodegradable mesh, allowing root systems to develop securely. Adjustable buoyancy chambers keep the seedlings above critical wave impact while maintaining tidal water exchange. After six to eight months, the mature seedlings are relocated to erosion-prone coasts, where their survival rate is significantly higher than traditional direct-planting methods.

IRAN

IR.1.

Inventors	Ilia Majidzadeh Heravi, Parsa Karimi Yazdi
Invention	CommuniMateSmartApp: Solutions for Deaf Communication Challenges
Institution	Iranian Youth Science and Technology Center (IYSTC)
Abstract	CommuniMate SmartApp addresses a critical global communication barrier faced by the deaf and hard of-hearing community, which limits their full participation in education, employment, and social life. Despite advances in assistive technologies, effective real-time, two-way communication remains a significant challenge. This AI-driven mobile application provides a comprehensive solution through three integrated core functionalities: • Speech-to-Text: Real-time transcription of spoken language into accurate on-screen text, enabling deaf users to follow

conversations seamlessly. • Text-to-Speech: Natural, high-quality vocalization of typed messages, facilitating communication from deaf to hearing individuals. • Sign Language Recognition and Education: Advanced machine learning and computer vision algorithms detect hand gestures, translating them into text, while interactive modules support users in learning and practicing sign language. Developed with MIT App Inventor for the user interface and Python leveraging TensorFlow for AI model training and deployment, the system integrates state-of-the-art speech recognition APIs and image processing techniques. Currently, it supports American Sign Language (ASL) alphabet recognition and provides natural-sounding text-to-speech output. Field evaluations conducted in educational and professional environments validate the app's effectiveness in enhancing accessibility and fostering inclusion. User feedback highlights the system's reliability, responsiveness, and user-friendly experience. Future enhancements aim to expand CommuniMate's impact by incorporating: • SOS Emergency Features: Automated voice calls with GPS-based location sharing for urgent assistance. • Multilingual Sign Language Support: Real-time recognition and translation of additional sign languages such as Russian (RSL), Pakistani (PSL), and Irish (ISL). • Advanced Noise-Cancellation: Improved speech recognition accuracy in challenging acoustic environments. • Full-Phrase Gesture Recognition: Enabling translation of complex sign language sentences to text and speech. • Direct Sign-to-Speech Conversion: Instant vocalization of sign language without intermediary typing. CommuniMate aspires to be a scalable, culturally adaptive, and technologically advanced platform that empowers the deaf community globally. By bridging communication gaps through cutting-edge AI and empathetic design, it contributes significantly to social equity and inclusion.

IR.2.

Inventors	Mehran Rajabi & Alireza Jafarnezhad
Invention	EcoNet Bin: An AI-IoT Powered Smart Waste Segregation System for Efficient Recycling
Institution	Iranian Youth Science and Technology Center (IYSTC)
Abstract	EcoNet Bin is an AI-IoT powered smart waste bin that automates waste segregation to enhance recycling efficiency. It reduces environmental impact and supports sustainable waste management with a low-cost, scalable design

IR.3.

Inventors	Mohammadsam Nematimoein, Mahan Ghadimi
Invention	Evaluation of Gamma-Aminobutyric Acid efficiency on Caco2 Colorectal Cancer Cells
Institution	Iranian Youth Science and Technology Center (IYSTC)
Abstract	Gamma-aminobutyric acid (GABA), a non-proteinaceous tetra-carbon amino acid, is widely distributed among organisms, with its synthesis primarily catalyzed by the enzyme glutamic acid decarboxylase. GABA production is largely attributed to its enzymatic properties. The physiological functions of GABA encompass blood pressure reduction, insomnia treatment, mood regulation, and diuretic effects. Notably, various bacteria, fungi, and yeasts can produce significant quantities of GABA, with lactic acid bacteria being particularly noteworthy. Colon cancer ranked as the second leading cause of mortality in 2020. This study initially involved GABA extraction from Lactobacillus acidophilus bacteria, followed by an examination of its impact on Caco2 colorectal cancer cells. The findings indicate the efficacy of GABA on these cancerous cells.

IR.4.

Inventors	Rojina Hoodehshenas , Baran Moradi
Invention	Preparation and characterization of an antimicrobial biodegradable biofilm packaging based on silver-zinc oxide nanocomposite with sago starch and ziziphora essential oil for protein based packaging application
Institution	IYSTC / Modabberan Highschool
Abstract	In this study, the antibacterial and physical properties of nanocomposite films made from sago starch and zinc oxide and silver nanoparticles combined with Ziziphora essential oil were investigated, particularly in protein packaging applications. To evaluate the antibacterial

properties of these films, the inhibition zone test was conducted for two bacteria: Staphylococcus aureus and Escherichia coli. The results showed that the nanocomposite films containing zinc oxide-silver nanoparticles effectively inhibited the growth of both bacteria, with the inhibition zone against Staphylococcus aureus being larger than that of Escherichia coli. This indicates a stronger antibacterial effect of the zinc oxide and silver nanoparticle combination against Staphylococcus aureus. Additionally, the zinc oxide-silver nanocomposite films made from sago starch and Ziziphora essential oil were effective in reducing water vapor permeability and water absorption capacity, thereby indirectly contributing to the preservation of protein products in terms of flavor, texture, and shelf life. These properties are especially vital in the packaging of protein products such as meat, poultry, and fish, which are susceptible to microbial contamination. Based on the obtained results, sago starch-zinc oxide and silver nanoparticle nanocomposites not only serve as antibacterial and biodegradable packaging but can also be considered suitable alternatives to traditional plastic packaging in the food industry and for maintaining food safety.

IR.5.

Inventors	Artin Radmatin, Ava Alebouyeh, Baran Bahman, Elyar Ferdosizadeh, MohammadHossein Ezzati
Invention	Evaluation of the effect of using magnetic gear in improving the performance of process systems based on mechanical gear
Institution	IYSTC – Valeh Educational and Cultural Institute
Abstract	The transmission of power in industry is ultimately limited by tribological constraints of gears-mechanical system- frictional costs of energy, sequential wear patterns, maintenance requirements- which present severe constraints on efficiencies. Breaking these barriers, the non-contact magnetic gearing becomes a real breakthrough. The idea takes advantage of self-regulating magnetic field topologies to realize a frictionless transmission of torque that does not involve direct contact and radically changes the concept of functional longevity and accuracy of industrial applications. The superiority of the concept is simulated in a multiphysics manner comprising 3D finite element analysis and dynamic circuit modeling of the whole system, and demonstrates the harmonic-free angular motion and adaptive flux regulation. Revolutionary potential is borne out experimentally: industrial application in homogenization mixers with a high shear and heavy-capacity conveyors are characterized by near-perfect synchronization and free of particulates. This paradigm surpasses what conventional systems can do, where mechanical compromises are required: it allows processing of pharmaceuticals without lubrication in aseptic work cell conditions, and positioning automotive assembly lines within microns. The qualitative analysis fixes the undeniable equipment: an extended period of efficiency (45 percent more functionality lifespan) and a systemic boost (27 percent efficiency increase) compared to the traditional gear mechanism. The innovations enable contamination-sensitive industries that will never need maintenance and mineral extraction conveyors that never experience downtimes. Additional advantages of technology position it even higher in sterile manufacturing ecosystems because of its mechanical silence and damping of vibrations. It is the first to bring self-governing output transportation infrastructure ready to put in place reactive upkeep with predictive operational longevity. Fundamentally aligned to the sustainability needs of the world today, the innovation solves the problems of the UNSDG in its physics: ends energy waste (SDG 7) by making friction losses near zero, provides infrastructure resilience (SDG 9) through the elimination of maintenance, and beats resource depletion (SDG 12) through longer service cycles. The development prospects will focus on AI-optimized magnetic mixers that can ensure adaptive viscosity control and intelligent conveyor systems with self-controlling material supply as the foundation of sustainable Industry 5.0.

IR.6.	
Inventors	Yasin Abbasi, Ali Rahbari, Nikasadat Hosseini, Kiarash Rshidzadeh Gargari, Eizadyar Jalali Pour
Invention	Medismart Smart Pharmacy Solution
Institution	IYSTC – Valeh Educational and Cultural Institute
Abstract	Medication errors are a major concern in modern pharmacies, often resulting from manual processes, miscommunication, and inconsistent prescription handling. These issues can lead to serious health risks, delays, and inefficiencies. To address this challenge, we developed MediSmartAI—an artificial intelligence–based system designed to automate and improve medication management in pharmacies. Our platform integrates AI algorithms and cloud computing to support intelligent prescription processing, secure user interaction, and adaptive medication guidance. The system is built with a modular and scalable architecture, enabling seamless integration with existing workflows. It also streamlines the medication purchasing process, making it significantly faster and more convenient for patients. In a simulated test environment, MediSmartAI demonstrated a 32% reduction in prescription errors and a 41% increase in processing speed compared to manual methods. MediSmartAI is designed to be adaptable across pharmacies, clinics, and digital healthcare ecosystems, offering a reliable and forward-thinking solution for intelligent pharmaceutical services.
IR.7.	
Inventors	Niki Abtahi, Parsa AhmadpourRahiminejad, Baran Derakhshandeh Daryasari, Sarina Nosrati, Ramiya Rahjou
Invention	Improving the design of pneumatic muscles: Simulation and analysis of the dynamic behavior of the system
Institution	IYSTC – Valeh Educational and Cultural Institute
Abstract	This project, using problem number 2 of the IYPT 2025 problem series, addresses a new design for making more economical, lighter artificial muscles with a higher similarity to biological muscles along with a control system to increase safety. The goal of designing this muscle is to create a low-cost, lightweight and accessible solution with optimal performance that can effectively replace traditional artificial muscles in soft robotics, rehabilitation and flexible mechanical systems applications. To simulate this muscle, a balloon is used as a hyperelastic material and a polyethylene mesh is used as the muscle framework. The materials were selected using various parameters such as mesh material, nozzle angle, mesh length, etc. They were compared by comparing the speed and displacement of the muscle. To control the system, a 2.5 solenoid valve was used to control the contraction, a timer to control the contraction time and a pressure regulator to keep the air pressure constant. Results indicate that increase in air pressure results in larger contractions but also triggers more higher internal stresses. Insertion speed has a significant effect on wave propagation within the muscle, with higher injection speed resulting in higher speed in contractions. Nozzle angle was found to affect the quality of expansion and contraction, with the application of a 0° angle producing higher frequency and more active motion. In addition, weight load testing showed that larger weights inhibited contraction and hindered wave propagation, with a 200g weight generating strongly localized wave patterns and lower energy transfer. Polyethylene mesh produced the strongest contraction of all the tested material, with more efficient energy return and response times than polyethylene and foam nets. Increased balloon sizes enhanced energy storage and range of contraction, whereas higher wall thickness lowered contraction efficiency by restricting flexibility. The results indicate that the new design of the PAM has better efficiency, faster response rates, and more consistent pressure distribution than conventional designs. The mechanical performance enhancements indicate its potential use in assistive technology and robot actuation, eventually leading to greater mobility and quality of life among physically disabled individuals

IR.8.	
Inventors	Matin Hayati
Invention	Automated Analysis and Visualization of EEG Signals for Seizure Prediction Using Frequency Band Decomposition
Institution	Iranian Youth Science and Technology Center (IYSTC)
Abstract	This project presents an automated method for processing and visualizing EEG signals to support seizure prediction. Using Python and Butterworth bandpass filters, EEG recordings from healthy individuals and epilepsy patients were extracted, filtered, and visualized across the five standard frequency bands (Delta, Theta, Alpha, Beta, Gamma). For each recording, a composite image was generated to represent the frequency profile and labeled based on the subject's condition. The results revealed clear differences in EEG patterns between healthy and epileptic individuals, especially in Beta and Gamma bands. This system provides an efficient way to generate well-organized, labeled datasets that are ready for machine learning applications. It offers a scalable and reproducible tool for researchers aiming to improve automated seizure detection.
IR.9.	
Inventors	Arshia Chehrezad, Taha Tajik
Invention	Fabrication of a Hydrogel Containing Captopril and Investigation of Its Effects on Oral Ulcers in Type 2 Diabetic rats
Institution	Iranian Youth Science and Technology Center (IYSTC)
Abstract	Oral wounds are a common yet understudied complication in patients with type 2 diabetes due to impaired tissue regeneration and prolonged inflammation. In this research, we developed and tested a novel topical hydrogel incorporating the antihypertensive drug Captopril, aimed at accelerating oral wound healing. The hydrogel was engineered with favorable physicochemical properties suitable for mucosal application. Using a diabetic rat model, we assessed its effects on wound closure, inflammation levels, and epithelial regeneration. Compared to the control group, the Captopril-based hydrogel significantly reduced inflammation, enhanced re-epithelialization, and promoted overall healing. These results highlight the hydrogel's potential as an innovative, effective treatment option for managing diabetic oral ulcers and improving clinical outcomes in patients with chronic wounds.
IR.10.	
Inventors	Raman Nafarieh
Invention	Evaluation of a novel herbal nanogel formulation on skin cancer cells utilizing the MTT assay.
Institution	Iranian Youth Science and Technology Center (IYSTC)
Abstract	Nowadays, there is a growing interest in biodegradable polymer-based materials due to their diverse applications in the biomedical field. Nanogels are hydrophilic polymeric networks at the nanometer scale, structured in a three-dimensional form with cross-linking bonds, capable of absorbing and retaining substantial amounts of water or aqueous solutions. Due to their nanoscale dimensions, these structures exhibit unique properties such as a high surface-to-volume ratio, suitable colloidal stability, and responsiveness to environmental stimuli, making them particularly well-suited for biomedical applications—especially in targeted drug delivery systems. In this study, a nanogel formulation was developed using plant-derived compounds, including extracts from Viola odorata, Curcumin (from Turmeric), and Spirulina platensis, based on a chitosan–hyaluronic acid polymer matrix. After evaluating its physicochemical properties, the effect of the nanogel on skin cancer cells was assessed using the MTT assay. The results demonstrated that a concentration of 100 mg/mL exhibited a significant pro-apoptotic effect on skin cancer cells.
IR.11.	
Inventors	Moeid Rajabi , Helena Rajabi
Invention	Protecting Curious Little Minds: A Smart Child Safety Solution with IoT and Image Processing

Institution	Iranian Youth Science and Technology Center (IYSTC)
Abstract	Protecting children in home and indoor environments is of utmost importance, as they are constantly exposed to numerous risks such as falling down stairs, burns, swallowing small objects, and injuries caused by sharp tools like knives and scissors. Considering the natural curiosity of children and the limitations of constant parental supervision, there is a pressing need for innovative technologies to intelligently monitor children and ensure a safe environment. The Protecting Curious Little Minds project offers an innovative solution to these challenges. Leveraging Internet of Things (IoT) and image processing technologies, this device is capable of identifying children, detecting hazardous objects, and monitoring entry into restricted zones. Parents can define danger zones within the camera's field of view by drawing boundaries on a live feed. If a child approaches or enters these zones, the device immediately sends an SMS alert to the parents. The system integrates a Raspberry Pi board, a camera module, and the OpenCV library to recognize hazardous objects such as knives, scissors, irons, and meat grinders, storing the detected data in a dedicated database. The detection model was trained on a dataset containing 915 images of children from diverse racial and national backgrounds to ensure broad representation. The dataset size was tripled through annotation and data augmentation techniques, enhancing the model's accuracy in identifying children and hazardous objects. Additionally, the modular design of the device ensures easy installation and usability in various environments such as homes and childcare centers. The device features an interactive user interface that allows parents to manage restricted zones and receive real-time updates. The prototype operates on direct power and is currently focused on testing its accuracy and functionality. The ultimate goal of this project is to reduce household accidents involving children and to provide an effective tool for monitoring home and public environments.
IR.12.	
Inventors	Parmida Salahmand , Sorena Salahmand
Invention	Development of Nano-Composites Containing Herbal Extracts with Resistance to Wear and Oral Bacterial Decay
Institution	Iranian Youth Science and Technology Center (IYSTC)
Abstract	Nanocomposites are hybrid materials composed of two or more distinct substances, with at least one component at the nanoscale (one-billionth of a meter). These materials typically consist of a matrix (the main substance) reinforced by nanoparticles or nanofibers. In dentistry, nanocomposites are used in applications such as tooth fillings, restoration of damaged teeth, enhancement of mechanical strength and corrosion resistance, improved aesthetics, and prevention of plaque formation. In this study, a nanocomposite incorporating a herbal extract with antibacterial properties was developed. Nanoparticles were utilized to improve mechanical characteristics like wear resistance, while the herbal extract was used to inhibit the growth of harmful oral bacteria. The resulting nanocomposite demonstrated excellent mechanical properties and, due to the antimicrobial nature of the herbal extract, offers a promising solution for enhancing oral health and extending the durability of dental materials. Furthermore, the developed composite exhibited resilience under routine mechanical stress and significantly reduced bacterial growth, helping to prevent dental caries.
IR.13.	
Inventors	Sam Rashidi, Radin Abasi
Invention	Design and Implementation of Smart NannyBot: A Humanoid IoT-Based Robot for Remote Child Activity

Institution	Iranian Youth Science and Technology Center (IYSTC)
Abstract	The Smart NannyBot project is designed and developed to remotely manage and guide children's daily activities using Internet of Things (IoT) technology. This system integrates an AVR microcontroller, Nodemcu Wi-Fi module, a graphical touch display (GLCD), audio module, and speaker, all assembled in a humanoid robot form. Upon startup, the robot introduces itself through voice playback and offers a touch-enabled menu for local interaction. Parents can connect to the robot via a web-based panel from their workplace or any location, sending schedules and activity commands such as study time, rest, exercise, or play. Smart NannyBot plays these commands via its speaker, prompting the child to follow them accordingly. The main goal of this project is to create an intelligent and interactive tool that promotes discipline, learning, and healthy routines in children in the absence of their parents. Utilizing IoT and two-way communication, the system enables remote control, customization of daily plans, and improved efficiency in child education and care**.**
IR.14.	
Inventors	Farnaz Nahalparvar, Fariba Shahrouei, Yas Pakdel, Hosain Rasaei, Mohamad Soori, Mobina Mokaffa, Zahra Mokaffa, Ahmadreza Elminejad, Reza Modares, Mahan Gholamiannejad, Mohamad Mozaffar, Mohamadreza Behfar
Invention	Smart Patch: Wearable Nanobiosensor for Continuous Monitoring and Early Leukemia Detection
Institution	NewScience.ac
Abstract	Early diagnosis of leukemia requires non-invasive methods capable of continuous monitoring of blood parameters. This article introduces a wearable smart adhesive patch equipped with electrochemical nanobiosensors that detect leukemia-associated biomarkers by generating a potential difference upon contact with subcutaneous blood. Data is wirelessly transmitted to a smart bracelet, where artificial intelligence (AI) algorithms analyze it. If abnormal values are detected, the system automatically alerts physicians via SMS. By integrating advanced nanomaterials, biosensors, and communication technologies, this innovation promises to revolutionize early diagnosis and personalized leukemia management.
IR.15.	
Inventors	Zhina Aminolroaya Karladani
Invention	Equine Behavior Monitor
Institution	Tevatron Accelerator
Abstract	One of the main challenges for novice riders is managing nervous horses and the unpredictability of their behavior, which can be dangerous. Existing solutions include in-person training and some basic equipment, but they do not provide immediate control or real-time feedback to the rider. Some patents have been filed for smart saddles and equine sensors, yet innovative methods for simultaneously calming the horse remain limited. The proposed idea is an intelligent system capable of detecting signs of stress in the horse and providing calming feedback. This system helps the rider maintain better and safer control. The objectives of the idea include enhancing safety, reducing stress, and improving the interaction between rider and horse. The technology used is simple and practical, allowing implementation without complex equipment. This solution can improve a safe and calm interaction between horse and rider without revealing the detailed mechanics of its operation.
IR.16.	
Inventors	Farin Esmaeili Gonharani
Invention	FocusGuard: Smart Study Lamp with Device and Posture Monitoring
Institution	Tevatron Accelerator
Abstract	Many students and university attendees experience distractions while studying or working, caused by mobile devices, digital gadgets, noisy environments, and improper sitting posture, which reduces focus and productivity. Existing solutions, such as study timers, mobile-blocking

apps, and simple desk lamps, each address only part of the problem and do not provide an integrated approach that manages devices, monitors posture, and offers environmental alerts. The proposed idea is a smart study lamp that includes a lockable compartment, an ambient noise sensor, and a posture-monitoring system. By combining hardware and intelligent software, the system provides instant feedback to the user and enhances concentration. The objectives of this idea include improving productivity, reducing distractions, and promoting proper posture habits and effective time management. The technologies involved include sensors for detecting body posture, sound sensors, a mechanical or electronic lock with a timer, LED alerts, and a central smart controller that coordinates all components. This innovative combination comprehensively manages the user's focus in real time, creating a more effective study and work experience.

IR.17.

Inventors Taranom Nasri , Tabasom Nasri , Kiana Heidari Abyaneh , Nika Amini, Aynour Eghtedaei
Invention Cattle Manure Emission Reduction And Control System
Institution Tevatron Accelerator
Abstract Gases emitted from cattle manure, particularly methane and ammonia, pose a dual challenge by producing unpleasant odors and significantly contributing to air pollution and climate change. Over the years, several approaches have been developed and patented to address this issue. These include the use of chemical additives to neutralize odors, biological filters that rely on microbial processes to capture and degrade gases, spraying systems that disperse deodorizing liquids, and household ionizer-based air purifiers aimed at reducing airborne particulates and odors in indoor environments. While each of these methods demonstrates some effectiveness, they often face limitations such as high operational costs, maintenance complexity, or lack of practicality for direct use within barns and large-scale livestock facilities. The proposed invention introduces a novel and practical approach by integrating a bladeless fan with an ionizer module. The bladeless fan ensures a smooth, quiet, and animal-safe airflow that draws contaminated barn air without disturbing livestock, channeling it directly into the ionizer module. Within this module, positive and negative ions are generated to neutralize odor-causing molecules and partially break down harmful gases such as ammonia. To further enhance purification efficiency, the system may incorporate activated carbon filters or bio-based filtration media, enabling an additional layer of gas absorption and environmental protection. The objectives of this innovation are to provide a cost-effective**,** safe, and energy-efficient solution that reduces gas emissions and odors at the source, improves the living conditions for animals and workers, and mitigates the environmental impact of livestock operations. Moreover, the system can be equipped with gas and odor sensors to enable intelligent control, automatically adjusting its operation based on pollution levels. This integration of bladeless airflow technology with ionization and optional smart filtering represents a novel application not previously utilized in the agricultural sector.

IR.18.

Inventors Hasti Ziglari, Mersana Taslimi, Pransa Mohgheghia Gourtani, Nafas Amini , Parsa Peyvasteh Shahsan Moradi Shahgharyeh
Invention MineVision Helmet
Institution Tevatron Accelerator
Abstract Working in mines is one of the most dangerous occupations in the world, as dust, smoke from fires, or explosions often prevent workers from finding emergency exit routes. Current safety helmets only provide physical protection and do not assist in guiding or saving lives. Various inventions and projects have been proposed in the past, such as laser guidance systems for imaging that are only used for camera targeting, smart helmets with sensors and positioning that lack route guidance, illuminated helmets that simply provide light, and some recent research focusing on gas detection and alerts. None of these solutions offer the ability to display an exit path using a laser or store and utilize a 3D map internally. My idea is to design a smart safety helmet that stores a 3D map of the mine and, in critical situations, displays a safe exit route on the ground using a safe linear laser, while also being equipped with environmental sensors to detect hazardous gases. The goal of this project is to enhance safety, reduce miner casualties, provide emergency guidance without relying on GPS or internet, and integrate advanced

	technologies into a simple, practical device. In addition to underground mines, this helmet can be used in tunnel and building rescue operations and in the oil and gas industry in enclosed and hazardous environments. The main technologies involved include 3D mapping (LiDAR or SLAM), local processing with a small microcomputer, a safe linear laser for path display, a lightweight high-capacity battery, and gas/environmental sensors. This combination makes the idea innovative, feasible, and directly impactful in saving lives.
IR.19.	
Inventors	Shahd Rezaei, Atbin Hasani Ashourzade, Artin Hasani Ashourzade, Aliehsan Navabi Kerdabadi , Amirali Arabian, Ryan Jabari
Invention	Smart Bag Gadget
Institution	Tevatron Accelerator
Abstract	Forgetting important items in bags is a common problem that can cause stress and inconvenience. Existing solutions, such as bags with tracking systems or internal lighting, often require tagging every item or do not provide real-time reminders. My idea is a smart gadget that can be integrated into any bag to detect when items are placed inside and alert the user if something is left behind. The innovation lies in combining lightweight sensors and simple detection methods to create a low-maintenance, energy-efficient system that helps users keep track of their belongings without complicated setup. The main goals are to reduce forgotten items, improve daily routines, and provide a practical and user-friendly reminder system. The technology involved includes small sensors for item detection, microcontrollers for processing, and wireless communication for alerts, ensuring the concept is both feasible and adaptable.
IR.20.	
Inventors	Mohammad Qasem Bahrami, Kian Karbalaeiebrahim, Artin Eslampanah, Mehrtash Razgordani, Samyar RezaSolTani, Padra NezamiRanjbar, Sayna RezaSolTani, Taha Maleki, Seyed AmirHooman Tabatabeinejad, Ayaz Salamzadeh Salmasi
Invention	Gum Smart
Institution	Novin Robotic Mirzania
Abstract	forefoot. The system dynamically redistributes oil between these reservoirs in real-time, based on the pressure detected by integrated pressure sensors. This mechanism effectively adjusts cushioning and support in response to different user activities such as walking, running, or standing.The smart insole acts as a semi-active suspension system for the foot, reducing pressure points and providing adaptive shock absorption. By analyzing pressure patterns, the system can detect abnormal gait or motor deficiencies, making it a valuable tool for both athletic optimization and rehabilitation applications.The design focuses on improving comfort, preventing injuries, and offering real-time biomechanical feedback to users or clinicians. The insole is compact, lightweight, and can be embedded into a wide variety of footwear.

IRAQ

IQ.1.	
Inventors	Zainab Al-Mousawi, Omar Al-Fahad, Kareem Al-Saidi
Invention	Solar-Cooled Greenhouse for Arid Climates
Institution	Mesopotamian Water and Energy Innovation Centre
Abstract	Iraq’s agricultural sector faces extreme heat and water scarcity, limiting year-round crop production. The Solar-Cooled Greenhouse for Arid Climates integrates photovoltaic panels with an evaporative cooling system powered entirely by solar energy. The roof is constructed with semi-transparent solar glass, which both generates electricity and filters excessive infrared radiation, reducing internal heat load. Electricity from the panels drives a high-efficiency evaporative cooler that circulates cooled, humidified air through the planting area. An automated control system monitors temperature, humidity, and soil moisture, adjusting irrigation and cooling cycles to optimize plant growth. Field trials in Basra produced consistent yields of tomatoes, cucumbers, and leafy greens during summer months, when traditional open-field cultivation is impossible. The system reduced water usage by 38% compared to conventional

	greenhouses and extended the productive season by three months, offering a sustainable path to food security in Iraq's harsh climate.

JAPAN

JP.1.	
Inventors	Haruto Tanaka, Mei Kobayashi, Riku Sakamoto
Invention	Self-Deploying Earthquake Isolation Platform
Institution	-
Abstract	Japan's high seismic activity puts residential and commercial buildings at constant risk of structural damage. The Self-Deploying Earthquake Isolation Platform is a retrofittable base system installed beneath existing buildings without the need for full structural reconstruction. It uses a network of compressed-air actuators and frictionless bearing pads that automatically engage when seismic sensors detect strong tremors. Within seconds, the actuators lift the building's load-bearing frame by 15–20 millimeters, allowing the bearings to absorb and dissipate horizontal shock waves. After the seismic event, the system gently lowers the structure back into place. In field simulations at a seismic testing facility in Sendai, the platform reduced structural stress loads by 72% compared to fixed foundations. The modular design allows installation in mid-rise buildings within two weeks, offering a practical and affordable seismic safety upgrade for densely populated urban areas.

JORDAN

JO.1.	
Inventors	Rania Al-Khatib
Invention	Solar Powered Mineral Extraction Unit
Institution	-
Abstract	Dead Sea region holds rich mineral resources such as magnesium, potassium, and bromine, but conventional extraction methods require high energy input and can damage the fragile ecosystem. The Solar-Powered Mineral Extraction Unit uses concentrated solar thermal technology to heat saline water in insulated evaporation tanks, accelerating crystallization without fossil fuels. A dual-stage filtration process separates the extracted minerals, which can then be packaged for industrial and cosmetic applications. The system is mounted on mobile platforms to allow seasonal relocation and minimize environmental disturbance. In pilot trials near Sweimeh, the unit recovered 18% more mineral content than traditional open-pond evaporation methods while reducing greenhouse gas emissions to near zero.
JO.2.	
Inventors	Omar Haddad, Lina Abu-Saif, Yazan Al-Majali, Dana Khalifeh, Khalid Barghouthi
Invention	Smart Greywater Recycling Tower
Institution	Amman Efficiency Lab
Abstract	Water scarcity is one of Jordan's most urgent challenges, especially in urban centers. The Smart Greywater Recycling Tower is a vertical treatment unit designed for installation in apartment buildings to recycle water from showers, sinks, and laundry. The system filters and disinfects greywater using a combination of sand filtration, activated carbon, and ultraviolet sterilization. An AI-driven monitoring system evaluates water quality in real time and adjusts filtration stages to maintain safety standards. The treated water is routed to toilet flushing systems and rooftop irrigation tanks. In a 12-month pilot in downtown Amman, participating buildings reduced freshwater consumption by an average of 29%, lowering both utility costs and municipal water demand.

KAZAKHSTAN

KZ.1.

Inventors	Aigerim Sadykova, Timur Kapanov
Invention	Yurt System
Institution	Central Innovation Hub
Abstract	Energy is stored in a compact lithium-iron phosphate battery pack housed in a weatherproof case, providing continuous power for lighting, small appliances, and communication devices. A smart controller prioritizes charging from whichever source—wind or solar—is more abundant at the time, ensuring optimal performance year-round. Field trials in the Almaty Region demonstrated an average daily output sufficient to power a family's needs for three days without recharge, even during periods of low wind or overcast skies. The system's portability and rugged design make it ideal for herders, researchers, and rural communities seeking reliable, sustainable energy without permanent infrastructure.

SOUTH KOREA

KR.1.

Inventors	Jihoon Park, Minseo Kim, Seungwoo Lee
Invention	Harvesting Network
Institution	-
Abstract	Each rooftop tank collects and filters rainwater, which is then shared across the network according to real-time demand data. This reduces strain on municipal supply during peak use.

KR.2.

Inventors	Hyunwoo Choi, Sora Jung, Donghyun An
Invention	AI-Guided Port Traffic Optimization Platform
Institution	-
Abstract	The AI-Guided Port Traffic Optimization Platform uses vessel tracking, predictive arrival algorithms, and dynamic berth assignment to streamline movements. Pilots in Busan reduced average vessel wait times by 14% and fuel consumption during docking by 9%, saving operators millions annually.

KR.3.

Inventors	Donghyun An, Yuna Lee, Hojin Kwon, Taemin Seo
Invention	Solar Wind Hybrid Highway Sound Barriers
Institution	Korean Microgrid Consortium
Abstract	These multi-functional barriers along highways reduce traffic noise while generating renewable energy. Vertical-axis wind turbines and bifacial solar panels are integrated into the barrier structure. In Incheon, a 1 km stretch generated 312 MWh annually, enough to power nearby streetlights and electric vehicle chargers.

KR.4.

Inventors	Jisoo Han, Minjae Kim, Nayoung Park
Invention	Autonomous Electric Tour Bus Fleet
Institution	Jeju Island Tourism Group
Abstract	Tourism vehicles on Jeju Island contribute significantly to emissions. This autonomous fleet operates on AI-controlled schedules that adapt to visitor demand and weather. Solar canopies at charging stations provide renewable power.

KR.5.

Inventors	Seojin Lim
Invention	Underground Hydroponic Farm Pods
Institution	-
Abstract	Repurposed underground parking levels are transformed into climate-controlled hydroponic farms. LED grow lights and nutrient recirculation systems maximize output

	while using 95% less water than soil farming. In Seoul, a single pod network produced 4.8 tonnes of leafy greens annually for local schools.
KR.6.	
Inventors	Gyutae Cho, Harin Song, Daeun Yoo, Sungho Kim, Hyejin Jang, Woosung Kang, Yerim Shin, Haemin Lee
Invention	Inductive Charging Lane for City Buses
Institution	Electric Mobility Research Alliance
Abstract	Embedded coils beneath designated bus lanes wirelessly charge electric buses while in motion. This reduces battery size requirements and extends service range.

MACAO

MO.1.	
Inventors	Samuel Lei, Crystal Ho, Marco Fong
Invention	Cooling Park Deck
Institution	Macao Invention and innovator association
Abstract	The roof integrates bifacial solar panels that generate power for lighting, cooling fans, and a misting network. The under-deck system draws water from the harbor, circulates it through cooling pipes, and releases the cooled air upward. A pilot near the Inner Harbour reduced surface temperatures by up to 7°C, creating a comfortable public space even during peak heat hours.
MO.2.	
Inventors	Kelvin Lao, Rui Gomes
Invention	AI-Powered Visitor Flow Management System
Institution	Tourism Sustainability Research Centre
Abstract	Tourist hotspots in Macao experience overcrowding that strains infrastructure and reduces visitor satisfaction. The AI-Powered Visitor Flow Management System uses real-time camera feeds, Wi-Fi signal mapping, and predictive analytics to monitor crowd density. Interactive kiosks and mobile app notifications guide visitors to less congested attractions or suggest alternate routes. In a six-month trial around Senado Square, peak congestion was reduced by 23% without lowering visitor numbers. The system also collected valuable data for urban planning, including seasonal patterns and tourist movement habits.
MO.3.	
Inventors	Fiona Un, Eric Choi, Ivan Wong
Invention	Turbine Array
Institution	-
Abstract	urbine Array uses multiple small, vertical-axis turbines arranged in a staggered pattern to maximize airflow capture without generating disruptive noise. The array connects to a hybrid inverter that manages both wind and optional solar input, supplying power for building common areas.
MO.4.	
Inventors	Charlotte Leong, Thomas Pang, Mei Lin
Invention	Indoor Air Quality Monitoring
Institution	-
Abstract	The Indoor Air Quality Monitoring and Response Network places compact sensors throughout buildings to detect particulate matter, CO_2 levels, humidity, and volatile organic compounds. AI algorithms analyze trends and trigger ventilation adjustments or localized air purification when thresholds are exceeded.

MALAYSIA

MY.1.	
Inventors	Ahmad Zulkifli, Nuraini Hassan, Lim Wei Sheng
Invention	Decentralized Halal Microfinance Platform

Institution	Nusantara Financial Research Cooperative
Abstract	The project introduces a decentralized microfinance ecosystem designed to serve underserved Muslim communities and small-scale entrepreneurs in Malaysia. By combining blockchain smart contracts with Shariah-compliant financing models, the system ensures transparent, interest-free transactions while reducing operational costs. Unlike conventional microfinance, the platform leverages digital identity verification through biometric authentication, ensuring inclusion for individuals without formal banking history. Peer-to-peer lenders can directly finance microbusinesses, while smart contract governance enforces repayment terms in accordance with Islamic finance principles. Additionally, the platform integrates real-time risk assessment powered by machine learning, enabling dynamic adjustments to credit scoring. This innovation not only expands access to ethical capital but also encourages cross-border collaboration in Southeast Asia, positioning Malaysia as a pioneer in digital halal finance.
MY.2.	
Inventors	Siti Ameerah, Kelvin Ong, Arvind Raj
Invention	AI-Powered Real-Time Compliance for Fintech Startups
Institution	Peninsular Fintech Lab
Abstract	This invention proposes an AI-driven compliance assistant integrated directly into financial applications. The system continuously monitors transactions against Malaysian central bank guidelines and global anti-money-laundering (AML) standards, issuing instant alerts for suspicious activities. Unlike traditional compliance audits, which are periodic and manual, this tool ensures continuous oversight, dramatically reducing risks of penalties. The AI model adapts to new policy updates in real time, offering contextual explanations and recommendations to fintech developers. By lowering the cost of compliance, this system empowers emerging fintech enterprises to innovate faster while maintaining legal and ethical integrity. The invention has the potential to become a regional compliance-as-a-service model, exportable across ASEAN's growing fintech sector.
MY.3.	
Inventors	Farhan Mahmud, Tan Li Wen
Invention	Cross-Border E-Wallet with Dynamic Currency Conversion
Institution	Straits Digital Innovation Hub
Abstract	This invention proposes a unified e-wallet that integrates dynamic currency conversion through blockchain-based liquidity pools. Travelers and merchants benefit from instant settlements in their preferred currency, supported by real-time exchange rate optimization. The system reduces reliance on banks for cross-border remittances by enabling direct digital transfers between wallets in different countries. In addition, the e-wallet incorporates multilingual customer interfaces, QR interoperability, and AI-based fraud detection, ensuring a secure and seamless payment experience.

MALDIVES

MV.1.	
Inventors	Mariyam Izzath, Afeef Jaleel, Nazeera Rauf
Invention	Ocean-Integrated Remote Health Monitoring Platform
Institution	Horizon Biomedical Innovation Centre
Abstract	This project introduces a remote healthcare monitoring platform specifically designed for communities that are dispersed across small, isolated locations. The system combines wearable biometric sensors with a cloud-based medical dashboard accessible to doctors and specialists. Patients can measure vital signs such as heart rate, oxygen levels, blood pressure, and body temperature in real time, with data securely transmitted via satellite-backed communication channels. Artificial intelligence algorithms analyze health indicators continuously, generating predictive alerts for conditions such as respiratory distress, cardiovascular irregularities, or early signs of infection. The design emphasizes

low power consumption and waterproof wearables, ensuring reliability in humid, coastal environments. Medical professionals benefit from automated triage tools, enabling them to prioritize urgent cases and deliver teleconsultations efficiently. By bridging the geographical gap between patients and urban medical centers, this invention reduces delays in diagnosis and treatment, enhances continuity of care, and empowers local clinics with access to specialist knowledge without the need for physical travel.

POLAND

PL.1.

Inventors: Piotr Kowalski, Aleksandra Nowak
Invention: Autonomous Adaptive Suspension System for Next-Generation Vehicles
Institution: -
Abstract: This project presents an adaptive suspension system designed for electric and hybrid vehicles, capable of self-adjusting in real time to road conditions and driving style. Using embedded sensors and AI-based predictive algorithms, the suspension analyzes terrain variations, weather conditions, and vehicle load, optimizing comfort and safety simultaneously. The innovation allows vehicles to reduce unnecessary energy consumption caused by mechanical inefficiencies, extending battery life for electric cars. Moreover, the system integrates with onboard navigation data to anticipate potholes, sharp turns, or elevation changes before the driver experiences them. This ensures not only a smoother ride but also reduced wear and tear on tires and chassis. With modular construction, the suspension system can be retrofitted into existing models, making it practical for rapid adoption in urban mobility fleets and personal cars alike.

PL.2.

Inventors: Wojciech Malinowski, Katarzyna Lewandowska, Marcin Zaremba
Invention: Hybrid Drone for Emergency Airlift in Remote Regions
Institution: -
Abstract: The invention introduces a hybrid drone with vertical take-off and landing (VTOL) capability, engineered to perform emergency airlift missions in regions where conventional aircraft or helicopters cannot reach efficiently. Powered by a hybrid propulsion system combining electric rotors and a lightweight combustion engine, the drone balances endurance with environmental sustainability. Its modular cargo bay allows it to carry medical supplies, rescue equipment, or communication devices. Advanced flight control systems enable stable operations in challenging weather, while AI navigation optimizes flight routes and energy usage. Unlike conventional drones, this design incorporates folding wings for long-distance flight efficiency and vertical lift capability for landing in constrained areas. The system is intended to support disaster relief, search-and-rescue operations, and urgent supply deliveries, contributing to the development of resilient aviation infrastructure.

PORTUGAL

PT.1.

Inventors: Duarte Ferreira, Leonor Matos
Invention: Smart Wearable System for Athletic Performance Optimization
Institution:
Abstract: This invention introduces a wearable technology platform that integrates flexible biosensors into sports clothing, capturing physiological and biomechanical data in real time. Unlike standard fitness trackers, the system focuses on professional and semi-professional athletes, analyzing advanced parameters such as muscle activation, lactic acid buildup, and joint strain. The data is processed by an AI-powered performance coach, which delivers personalized training adjustments, recovery schedules, and injury-prevention alerts. Coaches and athletes can access dashboards with predictive analytics, ensuring that training loads are optimized to balance performance gains with long-term

health. The wearable is designed with lightweight, breathable materials, enabling comfort without compromising accuracy. This innovation is positioned to transform how athletes train, recover, and compete by merging sports science with practical wearable technology.

PT.2.

Inventors
Invention
Institution
Abstract

Immersive Cultural Heritage Game Engine
Beatriz Gomes, Miguel Rocha, Sofia Fernandes
Lusitania Interactive Systems
A game engine designed to reconstruct and animate cultural heritage sites through immersive storytelling. The system allows players to explore historically accurate reconstructions of castles, towns, and monuments, enriched by interactive narratives that adapt to user decisions. Advanced 3D rendering techniques and procedural content generation provide a balance between historical fidelity and creative exploration. The platform incorporates multi-language support and augmented reality integration, allowing users to experience heritage content both virtually and on-site. By merging entertainment with cultural education, the engine strengthens the accessibility of heritage for younger audiences and offers museums, schools, and tourism sectors a novel tool for engagement.

PT.3.

Inventors
Invention
Institution
Abstract

Aero-Smart Textile for Athletic Safety and Performance
Ricardo Tavares, Helena Almeida

This project introduces a new category of smart textile engineered for athletes, combining advanced aerodynamics with embedded micro-sensors. The fabric is designed to reduce drag in sports such as cycling, swimming, and athletics, while simultaneously monitoring physiological signals including hydration levels, muscle strain, and cardiac performance. Data collected is processed in real time and transmitted to coaches or personal devices, enabling adaptive training and injury prevention. Unlike conventional sportswear, the textile integrates nanomaterials that self-regulate ventilation depending on environmental conditions, providing thermal comfort without compromising performance. The innovation bridges material science with sports analytics, offering athletes a seamless combination of safety, efficiency, and competitive advantage.

QATAR

QA.1.

Inventors
Invention
Institution
Abstract

Saif Al-Kuwari, Fatima Hassan
AI-Guided Quranic Learning Platform
Doha Institute for Faith and Technology
This project introduces an intelligent digital platform that integrates modern technology with the traditional methods of religious learning. The system provides a personalized approach to Quranic education by combining voice-recognition modules with adaptive feedback. Learners recite verses, and the platform instantly analyzes pronunciation, rhythm, and tajweed rules, offering corrective guidance in real time. Beyond recitation, the platform embeds contextual lessons on historical background, linguistic structures, and moral applications, ensuring that education extends beyond memorization. For younger learners, gamified modules with progress tracking encourage consistency and engagement, while advanced users can access in-depth tafsir explanations and cross-references to classical scholarship. The system operates bilingually in Arabic and English, ensuring inclusivity for both native and non-native speakers. By merging traditional religious instruction with contemporary digital tools, the platform provides educators, families, and institutions with a resource that preserves authenticity while expanding accessibility in modern educational contexts.

ROMANIA

RO.1.

Inventors: Andrei Marinescu, Ioana Petrescu
Invention: Quantum-Enhanced Thermal Regulation System
Institution: Institute for Advanced Physical Sciences Bucharest
Abstract: A novel thermal regulation system that leverages quantum material properties to optimize heat transfer and storage. Traditional cooling and heating mechanisms often rely on macroscopic methods that either waste energy or struggle to maintain precise stability across variable conditions. The proposed system employs engineered metamaterials with tunable quantum states capable of switching between high and low conductivity modes in response to external stimuli such as light or electromagnetic fields. This allows the device to dynamically manage temperature distribution with exceptional accuracy, while consuming significantly less energy than conventional technologies. Potential applications extend from microprocessors and superconducting circuits to industrial energy systems, where maintaining stable operating temperatures is critical for performance and longevity. Furthermore, the system's scalable architecture ensures adaptability to both small-scale electronics and large-scale infrastructure. By combining experimental physics with material engineering, this invention sets the foundation for the next generation of energy-efficient thermal solutions.

RO.2.

Inventors: Radu Ionescu, Alina Stan
Invention: Integrated Research and Education Platform for Interdisciplinary
Institution:
Abstract: an integrated digital platform designed to transform the way universities manage research, teaching, and collaboration across disciplines. The system unifies academic resources, laboratory access, and data-sharing networks into a single interface that encourages collaboration between departments traditionally working in isolation. Unlike conventional university management tools, the platform is built with modularity in mind: physics researchers can seamlessly share experimental results with computer scientists developing models, or with economists studying the impact of emerging technologies. It also includes a peer-to-peer funding and proposal tracking module, enabling students and faculty to co-develop grant applications and monitor outcomes in real time.

For students, the platform acts as both a learning management system and a research incubator, where coursework can be directly linked to active projects, fostering a culture of applied education. Faculty members benefit from enhanced visibility of ongoing work, making cross-disciplinary supervision and mentorship more effective. Moreover, the platform integrates multilingual capabilities, positioning universities to attract greater international participation. By streamlining collaboration and reinforcing the research-to-classroom pipeline, this invention redefines the university as not just a place of learning but as a dynamic engine of innovation.

SAUDI ARABIA

SA.1.

Inventors: Faisal Al-Mutairi, Khaled Al-Salem
Invention: Smart Performance Analytics for Football Development
Institution: Riyadh Sports club
Abstract: This project focuses on accelerating football progress through advanced data-driven solutions. It introduces a wearable and stadium-integrated analytics system that tracks players' biomechanics, energy output, and tactical positioning in real time. The data is processed using AI-driven algorithms to generate personalized training recommendations and predictive injury alerts. Coaches gain access to detailed dashboards that compare performance with regional and international benchmarks, while scouts and managers can

evaluate player potential using standardized metrics. The system also integrates fan-engagement features, allowing audiences to follow live performance indicators during matches. By combining athletic science with immersive technology, the invention strengthens local training academies, contributes to national team performance, and positions the region as a hub for sports innovation.

SA.2.

Inventors: Sami Al-Jaber
Invention: MENA Innovation and Collaboration Hub
Institution: Gulf Center for Strategic Development
Abstract: Envisions a digital hub designed to enhance collaboration and integration across the MENA region. The platform provides a centralized space for governments, businesses, universities, and research institutions to share resources, co-develop projects, and align strategies on innovation. It integrates tools for joint funding applications, intellectual property management, and multilingual communication to overcome cultural and linguistic barriers. A unique feature is its cross-border policy simulator, which models the potential outcomes of trade, energy, and technology initiatives before they are implemented. The system encourages knowledge exchange in areas such as clean energy, fintech, and digital health, creating a foundation for sustainable regional growth. By bridging gaps in connectivity and fostering a culture of shared advancement, this project helps the MENA region collectively compete on a global scale.

SA.3.

Inventors: Reem Al-Harbi, Abdullah Nasser
Invention: The New Face of Arabestan: Cultural Transformation Through Smart Urban Spaces
Institution: Vision Horizons Institute
Abstract: The cultural and technological transformation of the region by designing smart urban spaces that merge tradition with modernity. The initiative introduces adaptive architecture that integrates renewable energy, intelligent traffic management, and digital cultural platforms into city planning. Public areas are equipped with interactive installations that narrate the history, arts, and values of Arab heritage, while simultaneously offering modern amenities such as digital learning kiosks and augmented reality navigation. The design framework emphasizes inclusivity, ensuring access for individuals with disabilities, and sustainability, with water-saving systems and green corridors woven into city infrastructure. By presenting a balanced image that honors cultural roots while embracing global innovation, this project reflects the country's aspirations to reintroduce itself to the world with a progressive identity.

SINGAPORE

SG.1.

Inventors: Mei Ling Chen
Invention: Next-Generation Passenger Experience Ecosystem for Global Airports
Institution:
Abstract: This project introduces a transformative model for airport design and passenger services, inspired by the vision of creating the world's most efficient and enjoyable travel hub. The concept integrates intelligent automation, biometric-enabled seamless check-in, and real-time navigation assistance through augmented reality. Unlike traditional airport systems, the ecosystem does not only focus on moving travelers quickly, but also on creating a stress-free and engaging journey from entry to boarding.

Central to the system is a predictive passenger flow engine, capable of analyzing crowd patterns and dynamically redistributing resources such as staff, gates, and baggage services to prevent congestion. Smart lounges adapt to traveler profiles, offering personalized digital workstations, wellness pods, and curated cultural showcases, turning waiting time into a valuable experience.

Sustainability is also a key feature, with energy harvested from kinetic flooring in terminals, advanced waste recycling programs, and vertical gardens serving both as air purifiers and community learning spaces.

By merging technological innovation with cultural hospitality, this project not only reinforces Singapore's reputation as a benchmark for aviation excellence but also sets a template for future airports worldwide, where travel evolves into a seamless blend of efficiency, comfort, and inspiration.

SOUTH AFRICA

ZA.1.

Inventors: Sipho Mkhize, Thandiwe Jacobs
Invention: Sustainable Food Security Through Indigenous Crop Innovation
Institution: Cape Town Center for Agro-Innovation
Abstract: Food security by focusing on the development of new food products derived from underutilized indigenous crops of the region. The innovation lies in blending modern biotechnology with traditional agricultural knowledge to create nutrient-dense, drought-resistant food options that can support both local consumption and export markets. The system introduces a processing framework that converts raw harvests into fortified flours, plant-based proteins, and functional beverages without losing their nutritional integrity.

The project also integrates smart farming practices, using soil sensors and AI-based climate forecasting to optimize yields while minimizing resource consumption. Beyond its agricultural impact, it creates an inclusive economic model by empowering smallholder farmers to enter new value chains, supported by cooperative structures and local distribution networks. By tapping into forgotten crop varieties and aligning them with contemporary nutritional needs, this invention contributes to healthier diets, stronger food resilience, and greater economic participation for rural communities.

ZA.2.

Inventors: Lerato Molefe, Johan Pretorius
Invention: Conservation Tech for Protecting Endangered Wildlife
Institution:
Abstract: A next-generation conservation technology aimed at safeguarding endangered animals across reserves and national parks. The system deploys a network of solar-powered monitoring stations equipped with acoustic, thermal, and motion sensors to detect poaching activity, monitor migration patterns, and study animal health in real time. Data is transmitted to a centralized AI platform that analyzes behavior changes, alerts rangers to unusual movement, and predicts threats before they occur. One unique feature of the system is the integration of drone-assisted surveillance with automatic identification of species, reducing the need for intrusive tracking collars. The platform also connects with community-driven education apps, enabling citizens and students to actively participate in conservation efforts by reporting sightings or environmental threats. By merging technology with ecological stewardship, the project ensures that iconic species such as rhinos, elephants, and big cats can thrive while supporting sustainable eco-tourism and strengthening global conservation networks.

TAIWAN

TW.1.

Inventors: Wei-Lun Chen, Hsin-Yi Huang, Po-Chun Lee, Min-Fang Kuo, Tzu-Yi Chang, Mei-Lin Ho
Invention: Advanced Neuro-Interface for Rehabilitation
Institution: Taipei Municipal Jianguo High School
Abstract: A brain–computer interface specifically designed to assist patients recovering from strokes and neurological disorders. By combining EEG-based neural signals with AI-driven adaptive feedback, the system enables patients to control rehabilitation equipment through thought

patterns. Unlike traditional physiotherapy, the platform monitors brain plasticity in real time, adjusting training intensity based on individual progress. It includes a cloud-based data-sharing mechanism that allows physicians, therapists, and researchers to collaborate seamlessly. The innovation represents a step forward in merging digital health and neuroscience, aiming to reduce recovery times and increase independence for patients.

TW.2.

Inventors Chia-Hao Wang, Yu-Ting Liao, Cheng-Yu Pan
Invention Smart Hospital Logistics with Autonomous Delivery Systems
Institution Kaohsiung Municipal Kaohsiung Senior High School
Abstract Hospitals face increasing pressure to reduce operational costs while improving patient care. This invention introduces an autonomous robotic delivery network integrated with hospital information systems. The robots are equipped with secure compartments for transporting medications, lab samples, and medical supplies, ensuring speed and accuracy in high-demand environments. Using indoor mapping and dynamic navigation algorithms, they adapt to crowded hallways and changing layouts. The system reduces human error, minimizes staff workload, and improves infection control by reducing unnecessary human contact. By embedding smart logistics into hospital ecosystems, the project redefines operational efficiency in healthcare institutions.

TW.3.

Inventors Yu-Chen Hsieh, Li-Wei Tseng, Kai-Hao Lin, Hsuan-Yu Yeh
Invention Multi-Spectral Wearable for Preventive Health
Institution Taichung First Senior High School
Abstract A wearable health device capable of capturing multi-spectral data—covering heart rate, blood oxygen, hydration levels, and UV exposure—through a compact and non-invasive sensor suite. The device integrates with a mobile application that leverages machine learning to detect early warning signs of dehydration, cardiovascular risk, or skin damage. Unlike existing wearables, the device provides a holistic approach by combining physiological and environmental monitoring. The system also enables population-level insights for public health researchers, who can analyze anonymized data to detect trends and predict outbreaks. The invention thus bridges personal wellness and community health resilience.

TW.4.

Inventors An-Chi Liu, Fang-Yu Hwang
Invention Immersive Cultural Game Platform for Global Education
Institution Taichung First Senior High School
Abstract Creates an interactive gaming platform designed to immerse players in global cultural heritage while developing problem-solving and teamwork skills. Using VR and AR technologies, the platform enables players to explore historical sites, reconstruct ancient artifacts, and solve narrative-driven quests that simulate real-world cultural challenges. The system integrates educational curricula, allowing teachers to assign cultural missions as part of classroom activities. Beyond entertainment, the platform aims to foster global empathy and cultural understanding, positioning gaming as both a recreational and educational tool.

TW.5.

Inventors Ming-Wei Wu, Jia-Ying Shih, Hung-Chieh Lai, Shun-Yu Kuan
Invention Sustainable Aviation Materials from Bamboo Composites
Institution National Taiwan Normal University
Abstract This invention explores the potential of bamboo-based composite materials for use in the aviation sector. By employing advanced carbonization and lamination processes, the project produces lightweight, durable panels that reduce fuel consumption and carbon emissions in aircraft manufacturing. The material maintains high tensile strength while offering better biodegradability compared to synthetic composites. The innovation also

	draws upon local resources, creating economic opportunities for bamboo producers while contributing to global sustainability efforts in aviation.
TW.6.	
Inventors	Chun-Hao Chiu, Wen-Lin Hsu, Pei-Jung Chen, Yu-Hao Sun, Yi-Chen Kuo, Ting-Han Lin
Invention	AI-Driven Urban Farming Framework
Institution	National Taiwan University of Science and Technology, Tainan Municipal Chenggong High School
Abstract	Urban populations increasingly face food insecurity due to limited space and environmental stress. This invention proposes an AI-managed urban farming framework that integrates hydroponics, aquaponics, and vertical farming within modular units. The system employs predictive analytics for nutrient flow, light cycles, and harvest optimization, enabling maximum yield with minimal resources. Designed for deployment on rooftops and unused urban spaces, the framework connects to a digital marketplace where consumers can purchase produce directly from city farms. The invention combines technology, sustainability, and social innovation, turning cities into hubs of food resilience and reducing reliance on long-distance supply chains.

THAILAND

TH.1.	
Inventors	Claire Kietduriyakul
Invention	Location-based emergency help transmitter
Institution	Loomis Chaffee School, Windsor, CT, USA
Abstract	The Location-Based Emergency Help Transmitter is a compact, wearable device designed to enhance safety for vulnerable workers in remote areas, especially migrant fishermen. Using a 433 MHz radio signal, it sends SOS alerts to a base receiver with GPS and a SIM card. The receiver then forwards location details via SMS to designated contacts or rescue teams. The system features both manual and automatic activation, including alerts when the wearer is unconscious or in water. This innovation ensures emergency communication even in areas without mobile coverage, helping save lives during critical situations.
TH.2.	
Inventors	Poomkarn Taedullayasatit
Invention	Actimus
Institution	Shrewsbury International School, Bangkok (Riverside), Thailand
Abstract	Actimus is an innovative rehabilitation device that integrates electromyography (muscle contraction measurement) and electrostimulation (muscle stimulation) into a gamified, portable system. Designed for individuals recovering from injury, neurological disorders, or age-related muscle decline, it transforms traditional physical therapy into an engaging experience. The device connects to a mobile app that guides users through an interactive magic-tiles-style game, where real-time muscle activity and stimulation are synchronized. Actimus enhances neuromuscular control, accelerates recovery, and offers an affordable, accessible solution to physical rehabilitation, especially in underserved or home-based settings.
TH.3.	
Inventors	Sithsakorn Jantrakul
Invention	Wheelchair Lever Kit
Institution	Ruamrudee International School, Bangkok, Thailand
Abstract	The Wheelchair Assistant Lever is an innovative attachment designed to reduce the physical effort required to propel a wheelchair. Installed on the wheel, this lever-based mechanism allows users to move forward using ergonomic hand movements without touching the tire directly. The system improves posture, reduces hand strain, and enhances overall comfort and safety for users. It is lightweight, easy to install, and adaptable to standard wheelchairs, making it a practical solution for everyday mobility.
TH.4.	
Inventors	Issara Chaisupat

Invention	MATCHA: Robotic companion
Institution	Shrewsbury International School, Bangkok (Riverside), Thailand
Abstract	Matcha is a low-cost, interactive robotic device designed to support dementia patients, especially in ASEAN's low- and middle-income countries. Embedded in a plush toy of the patient's choice, Matcha can speak, blink, nod, and respond to touch, simulating the emotional comfort of real pet therapy. It also collects patient interaction data and uploads it to the cloud for caregivers and doctors to analyze behavior patterns. This solution promotes emotional well-being while providing valuable medical insight at a fraction of the cost of conventional robotic pets.
TH.5.	
Inventors	Pran Udomsawaengsup, Thaninki Prasitdumrong, Sirarin Prasitdumrong, Lapas Udomsawaengsup, Jeerasak Jitrotjanarak
Invention	CASE 1st AID distributor
Institution	Shrewsbury International school Bangkok and Pathumwan Demonstration school
Abstract	CASE 1st AID distributor is a vending machine that provides 1st aid kit sets helping us to get initial treatment if needed. It is compose of 3 channels of each 1st aid kit set box; kit set for wound care, kit set for fainting, kit set for insect bite. Each channel is controlled by sling which linked with a button and the sling will push the kit set box via the space that will drop the box to the outlet for customer to pick up.
TH.6.	
Inventors	Chalida Wongchai
Invention	Smart Floating Healthcare Clinic for Remote Communities
Institution	-
Abstract	In many regions, rivers and canals serve as lifelines for transportation and livelihood, yet communities living along these waterways often struggle with limited access to healthcare. This invention proposes a floating healthcare clinic that leverages renewable energy and telemedicine technology to deliver essential medical services directly to remote populations. The clinic is designed as a modular platform, powered by solar and micro-hydro systems, ensuring year-round operation with minimal environmental footprint.Inside the unit, compact diagnostic devices and AI-assisted health monitoring tools allow medical staff to perform checkups, collect vital signs, and run basic laboratory analyses. For more advanced care, a telemedicine system connects patients to specialized doctors in urban hospitals through high-speed satellite links, bridging the healthcare gap. The design includes mobile vaccination facilities, maternal care support, and a small pharmacy stocked with essential medicines. Beyond healthcare, the project emphasizes education, providing training sessions on preventive medicine, nutrition, and sanitation. Its long-term vision is to create a fleet of interconnected floating clinics, forming a resilient healthcare network across waterway-based communities. This innovation ensures equitable access to health services, reduces preventable diseases, and demonstrates how technology and sustainability can converge to solve critical social challenges.

TURKEY

TR.1.	
Inventors	Mehmet Aksoy
Invention	Smart Water Harmony System
Institution	-
Abstract	This invention seeks not only to provide a technological framework for efficient water management but also to build an active culture of sustainability. By aligning technological innovation with community participation, the Smart Water Harmony System represents a model that could be scaled across diverse regions and adapted for both modern cities and traditional settlements.

UKRAINE

UA.1.	
Inventors	Dmytro Kovalenko, Olena Hrytsenko, Yurii Petrenko
Invention	Advanced Radiation Shielding for Medical Imaging

Institution	Kyiv Polytechnic Gymnasium
Abstract	Medical imaging technologies such as CT scans and X-rays are indispensable tools for modern healthcare, yet radiation exposure remains a significant concern for both patients and healthcare professionals. This invention introduces a new class of composite shielding panels that combine lightweight polymer matrices with nanostructured metal oxides. The material offers superior radiation attenuation while maintaining flexibility and portability, making it suitable for integration into protective garments, mobile partitions, and patient drapes. Unlike conventional lead-based shielding, this material is environmentally safe, recyclable, and more comfortable for extended use. Additionally, the system integrates sensors that measure real-time exposure levels, transmitting data to hospital information systems for monitoring and compliance reporting. This dual functionality provides both physical protection and data-driven safety management. The innovation addresses critical gaps in healthcare radiation safety, aiming to protect medical staff and patients without compromising diagnostic accuracy or mobility in clinical environments.

UNITED KINGDOM

UK.1.	
Inventors	Eleanor Whitmore, James Hargreaves, Priya Patel
Invention	Powered District Heating Network
Institution	-
Abstract	The Tidal-Powered District Heating Network captures both kinetic and thermal energy from tidal flows to heat water for urban heating grids. Submerged turbine arrays generate electricity, while heat exchangers transfer seawater warmth into insulated pipelines supplying residential and commercial buildings.

UK.2.	
Inventors	Amelia Brown, Oliver Patel, Sophie Williams, Ethan Johnson, Mia Clarke
Invention	Eco-Smart Lunchbox
Institution	Greenfield Primary School, London
Abstract	This project was created by a group of young students who noticed that a lot of plastic waste comes from food packaging in schools. Their idea is the "Eco-Smart Lunchbox," a reusable lunchbox made from biodegradable materials that helps reduce waste while keeping food fresh. The lunchbox has special compartments to separate fruits, snacks, and main meals, preventing food from getting soggy or spoiled. A small sensor inside the lid can detect whether the food is still safe to eat and gives a simple green or red light so children know if their lunch is fresh. It also connects to a simple mobile app that parents can use to plan balanced meals, making sure children get healthy food every day. The lunchbox is designed with fun colors and characters so that children enjoy using it, and it can even include small reminder stickers encouraging recycling and healthy eating. Through this invention, the students wanted to show that even small changes in daily life can help protect the environment. Their vision is that one day every child in schools could use an Eco-Smart Lunchbox, making lunchtimes healthier and greener.

UNITED STATES

US.1.	
Inventors	Jacob Martinez, Ava Turner
Invention	Decentralized Blockchain Voting System
Institution	FutureTech High School
Abstract	Blockchain-powered voting system designed to ensure transparency, security, and trust in democratic processes. Each vote is stored as an immutable record on a distributed ledger, preventing tampering or manipulation. Voters can confirm their ballots without revealing their identities, creating a balance between privacy and accountability. The system also incorporates biometric authentication for secure access, reducing the risks of fraud. By applying blockchain, the invention aims to strengthen public confidence in elections and serve as a model for digital governance in the future.

US.2.	
Inventors	Leah Robinson, Amin Yazdi
Invention	Smart Government Transparency Dashboard
Institution	Washington Civic Innovation Academy
Abstract	This invention creates an interactive digital dashboard that displays government budgets, projects, and decision-making processes in real time. Citizens can track how tax money is spent, monitor project progress, and even provide feedback directly. Using AI analytics, the platform simplifies complex data into easy-to-understand visuals. The goal is to enhance accountability and build a stronger bridge between government institutions and the public.
US.3.	
Inventors	Brian Adams, Sofia Hernandez, Anthony White
Invention	AI Analytics for World Cup Player Performance
Institution	Global Sports Academy, Miami
Abstract	AI-driven analytics to evaluate player performance during World Cup tournaments. Wearable sensors record biometrics such as speed, stamina, and heart rate, while AI interprets the data to predict fatigue, risk of injury, and overall efficiency. Coaches can make real-time adjustments during matches, while fans gain new levels of interactive engagement through detailed performance breakdowns.
US.4.	
Inventors	Marcus Lee
Invention	Virtual Reality Education on Sexual Health
Institution	-
Abstract	VR-based platform designed to teach young people about sexual health in an engaging, safe, and age-appropriate way. Interactive simulations help students understand anatomy, consent, healthy relationships, and safe practices. The immersive nature of VR encourages participation and creates a confidential environment for learning sensitive topics.
US.5.	
Inventors	Kevin Rogers, Jasmine Patel, Emily Al-Saif
Invention	AI-Driven Smoking Cessation Companion
Institution	Midwest Health Science Academy
Abstract	mobile companion app powered by AI that helps individuals quit smoking. Using behavioral data, it delivers personalized motivation, monitors cravings, and connects users with support communities. A smart inhaler device records nicotine intake and syncs with the app to provide real-time progress tracking. The system combines digital coaching with peer encouragement to maximize success.
US.6.	
Inventors	Zhang Wei, Liu Fang, Liang Chen, Mei Hua
Invention	Automated Café Assistant Robot
Institution	Silicon Valley Robotics School
Abstract	Café assistant robot capable of brewing coffee, preparing simple snacks, and handling customer service tasks such as order-taking and payment. Designed for small cafés and restaurants, the robot reduces wait times and provides consistent service quality. Its modular design allows customization for different types of menus, making it a versatile solution for modern urban dining.
US.7.	
Inventors	Hunter Davis
Invention	Sustainable Fashion Lab
Institution	-
Abstract	Eco-friendly fabrics created from agricultural waste such as banana peels and orange fibers. These materials are biodegradable, lightweight, and stylish, offering a sustainable

	alternative to synthetic textiles. The project also introduces a digital platform that tracks the entire supply chain, giving consumers insight into the environmental footprint of their clothing choices.
US.8.	
Inventors	Daniel Scott, Rachel Young, Chloe Miller
Invention	Smart Fast-Food Nutrition Optimizer
Institution	Los Angeles Tech Academy
Abstract	A system that makes fast food healthier without compromising taste. Using smart algorithms, the system adjusts recipes to reduce fat, sugar, and salt while maintaining flavor. Restaurants can integrate the system into their cooking equipment, ensuring every meal is both enjoyable and nutritionally balanced.
US.9.	
Inventors	Joshua Evans
Invention	Relationship Wellness AI Platform
Institution	Harmony Research School
Abstract	Mobile platform that uses AI to provide relationship advice, conflict resolution tools, and emotional support exercises. It analyzes communication patterns between partners and suggests strategies to improve understanding and empathy. The platform encourages healthy, respectful, and long-lasting relationships while safeguarding user privacy.
US.10.	
Inventors	Grace Thompson, Samuel Reed, Natalie Brooks**,** Guo Yan**,** Deng Rui, Huang Min**,** Zhou Li
Invention	Social Media for Cancer Awareness
Institution	Hope Academy of Science and Health
Abstract	Social media platform dedicated to cancer awareness, support, and research fundraising. Patients and families can share experiences, while medical professionals provide verified information. Integrated AI curates reliable content and blocks misinformation. Gamified donation challenges engage global communities, making cancer awareness both accessible and impactful.
US.11.	
Inventors	Shadi Ito, Sofia Rodriguez, Elijah Carter
Invention	Beyond 5G: Adaptive 6G Internet Mesh
Institution	Pacific Tech Preparatory
Abstract	The next frontier of connectivity will not only be about faster speeds but adaptive resilience. This invention outlines a 6G mesh network designed to self-heal during outages by leveraging edge computing and AI-based routing. Unlike conventional towers, the system deploys thousands of micro-nodes embedded in urban infrastructure such as streetlights and building facades. These nodes interconnect autonomously, ensuring seamless ultra-low latency communication, even under environmental or cyber stress. The approach democratizes digital access by reducing dependence on expensive centralized infrastructure.
US.12.	
Inventors	Carla Rodriguez, Ahmed Khan
Invention	Silicon Valley on a Budget
Institution	-
Abstract	Envisions a decentralized incubator ecosystem where aspiring entrepreneurs can access startup resources without relocating to costly hubs. By combining online accelerators, micro-mentorship, and AI-driven funding simulations, the model allows innovators in smaller towns to test and refine their ideas. A digital token-based credit system ensures fair distribution of resources while fostering a global collaborative spirit. This initiative reduces barriers for underrepresented innovators and makes the “Silicon Valley dream” affordable anywhere.
US.13.	

Inventors	Soo Jin Park
Invention	Orbital Waste Capture System
Institution	Global Space Preparatory School
Abstract	With increasing satellite launches, orbital debris poses a critical threat. This invention is a hybrid magnetic and net-based capture system designed to safely retrieve metallic and composite fragments. The units, powered by solar sails, operate autonomously, scanning debris trajectories and executing precision capture maneuvers. Captured material is compacted and stored for controlled descent into Earth's atmosphere or recycled at orbital stations. The project aims to extend satellite life expectancy and secure a safer path for future exploration.
US.14.	
Inventors	Lin Xu, Emily Johnson
Invention	Transparent Hair Bio-Fibers
Institution	Nova Bioscience High School
Abstract	The team developed synthetic hair fibers with transparent yet durable structures, intended for both medical and cosmetic use. These bio-fibers can act as conduits for light-based therapies in dermatology, assisting with scalp treatment and drug delivery. Beyond healthcare, the fibers enable futuristic fashion where embedded micro-lights can change hair color dynamically without dye. This project highlights the intersection of health, beauty, and biotechnology in daily life.
US.15.	
Inventors	Jason Kim, Fatima Noor
Invention	Gamified Fitness Pods
Institution	-
Abstract	The invention proposes immersive exercise pods combining augmented reality and adaptive resistance systems. Users experience a game-like environment where workouts translate into real-time challenges such as climbing mountains or racing against avatars. A biometric monitoring system adjusts intensity to maximize safety and results. These pods encourage consistent engagement, particularly among younger generations, by merging gaming culture with physical activity.
US.16.	
Inventors	Sofia Delgado
Invention	Inclusive Learning through LGBT Curriculum AI
Institution	-
Abstract	AI-powered educational platform that curates learning materials promoting inclusivity and representation of diverse identities, including LGBT+ communities. The system adapts content based on students' ages and cultural contexts, ensuring respectful, balanced exposure. Teachers can access custom lesson plans, while parents and students can explore stories highlighting empathy and acceptance. The long-term goal is to normalize diversity in curricula worldwide.
US.17.	
Inventors	Omar Farouk, Chloe Simmons, Max Liu
Invention	Quantum-Secure Bank Transfer System
Institution	-
Abstract	A blockchain-integrated payment system fortified with quantum-resistant encryption. It ensures that bank transfers remain secure against emerging quantum computing threats. Transactions are verified by multi-layered consensus nodes operating in both private and public chains, balancing speed with security. The design especially benefits cross-border payments, reducing processing costs and eliminating vulnerabilities in current SWIFT-like systems.
US.18.	

Inventors	Priya Ramesh, Ethan Lee
Invention	Modular Homeless Shelter
Institution	Humanitarian Innovation Center
Abstract	Lightweight, foldable pods providing temporary shelter for homeless individuals. The pods include integrated solar panels, fold-out beds, and lockable compartments for personal safety. Built from recycled materials, they can be rapidly deployed in urban zones and transported on trucks for emergency relief. The initiative addresses not only shelter but dignity, offering transitional stability for reintegration into society.
US.19.	
Inventors	Portable Burger House
Invention	Anna Müller, Chen Rong
Institution	-
Abstract	A compact, trailer-based modular kitchen that produces high-quality, customizable burgers anywhere. The unit operates with energy-efficient grills and robotic assistants for fast preparation. Customers can order via mobile apps, and the system tracks dietary preferences, ensuring healthier fast-food options. This invention supports micro-entrepreneurship by allowing small operators to run sustainable food businesses with minimal upfront investment.
US.20.	
Inventors	Hana Cho
Invention	Eco-Cinema
Institution	Creative Media
Abstract	The eco-cinema concept integrates sustainable energy sources with interactive storytelling. Projection domes powered by kinetic energy from audience movement create an immersive viewing experience. Films adapt dynamically to crowd reactions measured through wearable sensors. Beyond entertainment, the model educates communities about sustainability by embedding energy-awareness directly into leisure activities.
US.21.	
Inventors	Aisha Mohammed, Carlos Mendes,Priyanka Sharma
Invention	Debt-Free Futures: AI Credit Counseling
Institution	-
Abstract	AI-driven counseling system designed to help families restructure debt without falling into predatory loan traps. By analyzing spending habits and offering gamified budgeting strategies, the platform empowers users to manage repayments sustainably. The system connects users with micro-finance networks, ensuring fair access to capital while preventing bankruptcy cycles.
US.23.	
Inventors	Laura Jensen
Invention	Manjaro Open Learning Hub
Institution	TechBridge High School
Abstract	Leveraging the lightweight Manjaro Linux OS, students designed an open-source educational hub optimized for low-income schools. The system runs on refurbished laptops, providing access to coding tools, STEM simulations, and e-learning platforms without licensing costs. It highlights the potential of open-source ecosystems in bridging global digital divides.
US.24.	
Inventors	Sarah Johnson , Kim Hyeon, Maria Alvarez
Invention	Bio-Adaptive BodyFit Suit
Institution	Future Health Academy
Abstract	The wearable fitness suit embedded with biosensors and flexible resistance bands. The suit adjusts intensity during workouts based on heart rate, hydration, and muscle strain.

	Data syncs with an app that provides AI-generated routines tailored for individual health goals. It blends medical monitoring with active training for a new era of personal fitness.
US.25.	
Inventors	Isabella Rossi
Invention	NeuroLove: Emotional Synchronization Platform
Institution	Global Psychology Prep School
Abstract	An experimental platform where couples wear neural sensors to measure emotional resonance in real time. The system visualizes compatibility through color-coded patterns and suggests empathy-building exercises when mismatches occur. Beyond personal relationships, the technology could aid in therapy and conflict resolution, offering science-driven insights into human connection.
US.26.	
Inventors	Jason Wright , Omar Abdullah
Invention	MetaVerse Campus: Education Beyond Screens
Institution	-
Abstract	This project creates an immersive "Meta Campus" where students worldwide attend virtual classrooms in 3D environments. Lessons include interactive labs, historical recreations, and AI tutors. By blending VR with real-world coursework, the system democratizes elite education and connects students across continents.
US.27.	
Inventors	Emily Parker
Invention	Data Gap Navigator
Institution	Innovation in Analytics Academy
Abstract	By mapping gaps, it enables researchers to prioritize areas where knowledge is lacking, especially in under-represented regions. It can be applied to climate change, public health, and economics, ensuring better-informed policies.
US.28.	
Inventors	Ricardo Fernandez
Invention	Autonomous Micro-Satellites for Disaster Relief
Institution	-
Abstract	This project designs a fleet of low-cost micro-satellites that rapidly deploy during disasters. They provide real-time mapping, communication relays, and data collection, ensuring first responders have actionable information within minutes. Unlike traditional satellites, these units are disposable, reducing launch costs and enabling scalable coverage.

VIETNAM

VN.1.	
Inventors	Vu Thao Nguyen, Trinh An Phuc, Hoang Tran Viet Anh, Vu The Dan
Invention	AI-Driven Early Parkinson's Detection System
Institution	VINA-STEAM Technology Education Company
Abstract	The project "AI-Driven Early Parkinson's Detection System" is designed to create a tool that supports the effective and accurate diagnosis of Parkinson's disease. The software leverages advances in AI and camera-based image analysis to monitor two key physiological indicators: blink frequency and mouth opening and closing speed. These nonverbal features are closely linked to early neural dysfunction in Parkinson's disease but are seldom exploited in current diagnostic methods.
VN.2.	
Inventors	KIEU QUYNH HUONG, HOANG MINH THU, LE TRINH BAO NGHI
Invention	Factors Affecting the Capital Adequacy Ratio of Commercial Banks in Vietnam
Institution	-
Abstract	This study analyzes the economic and banking market factors influencing the Capital Adequacy Ratio (CAR) of Vietnamese commercial banks using both quantitative and qualitative methods. By examining these factors, the research aims to provide actionable recommendations for

	commercial banks, the State Bank of Vietnam, and the government to enhance compliance with Basel II and Basel III standards. The findings are expected to strengthen the banking sector's stability and resilience, ensuring alignment with international regulatory requirements. This comprehensive approach will contribute to sustainable development in Vietnam's banking industry by addressing key challenges in maintaining adequate capital levels.
VN.3.	
Inventors	Tran Diep Anh, Nguyen Phu Khang, Truong Gia Hung, Nguyen Minh Hieu, Do Huy Khanh, Bui Sy Duy, Phung Tan Dat, Nguyen Duc Thuan, Vu Gia Khanh
Invention	AI Applications for the Deaf
Institution	UVN University of Science
Abstract	• Use artificial intelligence system to translate hand sign language into audio. • Integrate audio-to-text conversion function to support two-way interaction. • Integrate cost-effective hardware solutions such as Raspberry Pi 4 for data processing, making the system more flexible and easier to deploy.
VN.4.	
Inventors	Nguyen Ngoc Quan, Khuat Quang Nhat, Nguyen Nam Khanh, Pham Gia Khang, Truong Mai Chi
Invention	Antidiabetic effect of caffeic acid from *Perilla frutescens* leaves in mice
Institution	UVN University of Science
Abstract	+ Caffeic acid was isolated from *Perilla frutescens* leaves + Caffeic acid is anti-inflammation at a concentration of 30 µg/mL on Raw 264.7 cells + Caffeic acid has the ability to activate inactivated insulin at a concentration of 30 µg/mL on 3T3-L1 cells. + Caffeic acid at a dose of 30 mg/kg has the ability to treat mice with diabetes through the control of glucose, insulin, and HbA1c.
VN.5.	
Inventors	Trinh Quang Huy, Do Minh Anh, Nguyen Minh Duc, Vu Phuong Linh, Phan Trung Hieu, Tran Nguyen Kiet, Tran Nguyen Nhat Minh
Invention	Therapeutic efficacy of Pinoresinol from Vietnamese Gnetum montanum on gout in mice
Institution	UVN University of Science
Abstract	+ Pinoresinol was isolated from Vietnamese Gnetum montanum + Pinoresinol was anti-inflammation at a concentration of 40 µg/mL on Raw 264.7 cells. + Pinoresinol inhibited NLRP3 on Raw 264.7 cell + Pinoresinol inhibited MSU-induced NLRP3 inflammasome activity in cells at a concentration of 40 µg/mL + Pinoresinol reduced joint hyperswelling and IL-1beta in gouty mice at a concentration of 40 mg/kg.
VN.6.	
Inventors	Nguyen Ha Bao Khanh
Invention	Analyze the factors affecting gold price volatility
Institution	IVY Training Co.,Ltd, Hanoi, Vietnam
Abstract	A method for forecasting gold price volatility using a bidirectional Long Short-Term Memory (BiLSTM) neural network is disclosed. Conventional methods fail to capture the nonlinear temporal dependencies in gold prices driven by economic, financial, and geopolitical factors, thereby limiting predictive accuracy. This invention demonstrates superior performance, particularly during periods of geopolitical instability, by analyzing the key factors influencing gold prices. It offers a scalable solution for financial risk management and trading strategies, benefiting both investors and financial institutions.
VN.7.	
Inventors	Nguyen Gia Bach
Invention	StudyMate: An AI-powered voice assistant for student
Institution	IVY Training Co.,Ltd, Hanoi, Vietnam

Abstract	StudyMate is an AI-powered voice assistant designed to support personalized learning for students through natural voice interaction. Built on a Raspberry Pi 3B+ platform, it utilizes speech recognition, Google Gemini API, and text-to-speech synthesis to provide instant academic support and stress-relief dialogue. The device offers a low-cost, distraction-free learning solution, particularly for students in under-resourced areas. StudyMate enhances engagement and learning outcomes with tailored responses in English and Vietnamese, making it a practical tool for personalized education.
VN.8.	
Inventors	Nguyen Duc Minh
Invention	Intelligent Stress Management System
Institution	IVY Training Co.,Ltd, Hanoi, Vietnam
Abstract	Stress is a persistent issue in both academic and professional settings, adversely impacting mental health and overall productivity. This paper introduces SparkFlow, a lightweight AI driven web application designed to generate personalized stress relief plans in real time by leveraging the free tier Gemini API from Google. The system customizes its suggestions based on individual user inputs including daily schedules, self reported stress levels, and personal interests while storing and analyzing historical stress data using SQLite. Trend visualization is facilitated through Chart.js, offering users insights into their emotional patterns. Built with Flask and deployed on Render, SparkFlow supports low resource devices and mobile usage via Progressive Web App (PWA) functionality.
VN.9.	
Inventors	PHAN BAO CHAU, NGUYEN THAI MINH, NGUYEN MINH DIEN SUNNY, NGUYEN BUU NGHI, LE DO DUC ANH,
Invention	APPLICATION OF DATA ENVELOPEMENT ANALYSIS (DEA) MODEL AND KPI ANALYSIS FRAMEWORK TO ASSESS MODERN SUPPLY CHAIN PERFORMANCE. CASE STUDY APPLICATION ON APPLE, ZARA AND DHL
Institution	University of Georgia, VNU-HCM High School for the Gifted, FPT Schools, Vinschool Central Park, Hanoi – Amsterdam High School for the Gifted
Abstract	In the context of Industry 4.0 and global value chain shifts, modern supply chain management (SCM) is essential for enhancing competitiveness. Technologies like IoT, AI, and Big Data enable real-time coordination and adaptability, especially amid disruptions such as COVID-19 and geopolitical crises. SCM optimization goes beyond cost reduction, aiming to boost responsiveness, sustainability, and strategic value. For Vietnam, transitioning toward a modern production and logistics hub, adopting advanced SCM models is urgent. This aligns with national goals under CPTPP, EVFTA, and RCEP, and supports the country's 2030 logistics development strategy and digital, green economic transformation.

“May these pages stand as a testament to the boundless spirit of invention and the shared commitment to advancing humanity.”

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