



STEM Challenge 1

**Optimize workspaces
and
hardware/software
needs of employees
through automated
processes**

ALM Services

PROPOSAL REASONING

Under the COVID19 context, medium/large companies and public entities require a solution for managing working spaces and equipments to allow employee coordination regarding full- or part-time and remote working arrangements. They also require a solution for tracking the actual needs of hardware maintenance and software license subscriptions to rationalize the costs of fees

INNOVATIVE ASPECTS TO BE VALUED

- ❏ Allow easy cooperation between employees in an intuitive way
- ❏ Include mechanisms to detect anomalies or abuses
- ❏ Integrate machine learning systems
- ❏ Compatibility with customary tools like Microsoft Office 365

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STEM Challenge 2

Elucidate whether inappropriate medication intake and daily activity contribute to the risk of a fall, especially for the elderly

APA Group

PROPOSAL REASONING

Both chronic diseases requiring multiple medications and accelerated lifestyles are becoming increasingly common in our society and may constitute underestimated causes of falls and emergency situations worldwide. This may be particularly critical in the case of the elderly that have limited their mobility and companionship due to the COVID19 situation

INNOVATIVE ASPECTS TO BE VALUED

- ✘ Integrate many variables related to patient physical characteristics, psychological profile, health state, medication intake, medication side effects, etc.
- ✘ Application of mathematical algorithms
- ✘ Minimum 70% reliability in fall detection through non-contact technologies

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STEM Challenge 3

Locate and report observations of pest or pathogen damage to poplar plantations in real time through an easy-to-use solution

Bosques y Ríos

PROPOSAL REASONING

The sustainable production of poplar wood as a renewable resource is currently threatened by the increased incidence of pests and pathogens. The lack of coordination and information exchange between multiple public and private stakeholders in this matter is worsening the problem by hindering effective warning systems and decision making

INNOVATIVE ASPECTS TO BE VALUED

- ❏ Citizen Science approach
- ❏ Multiple potential users such as technicians, owners, forestry agents, students, general public, etc.
- ❏ Multidisciplinary approach
- ❏ Integrate complementary materials for the acquisition of pest/pathogen detection skills and knowledge

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STEM Challenge 4

Detect and eliminate defective batches of polyethylene granulate material prior to be used in the production line of plastic pipes

CARBOSPEC

PROPOSAL REASONING

Foaming of polyethylene regranulate material used for manufacturing plastic pipes causes irretrievable defects in the production line, significantly increasing production waste and costs

INNOVATIVE ASPECTS TO BE VALUED

- ✘ Integrate a rapid and simple-to-use test
- ✘ The solution should improve the performance of companies that use polyethylene regranulate

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STEM Challenge 5

Monitor and facilitate the delivery process of paver asphalt mixes optimising logistics and coordination through real time data

EUROVIA

PROPOSAL REASONING

In road engineering, the logistics of asphalt paving, including order and delivery, is quite often a complicated process in which many people are involved, especially construction site managers, asphalt plant managers and truck drivers

INNOVATIVE ASPECTS TO BE VALUED

- ✘ Integrate real time interaction with all users (truck drivers, managers, operators, etc.)
- ✘ Automatic refreshing of truck position and data
- ✘ Adjustable to different operating systems and devices

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STEM Challenge 6

Design an easy-to-implement solution to recycle laminated/coated products from barrier liners used in paper packaging through existing technologies

SONOCO

PROPOSAL REASONING

While paper recycling is well established, liner material and any other non-pulpable material are being removed from the pulp. The majority of laminated or coated paper packaging is currently not collected or the contraries / reject of the pulping process not recycled. Typically, these materials end up in incineration or potentially in a landfill

INNOVATIVE ASPECTS TO BE VALUED

- ✘ Compatibility to a wide range of material compositions in the reject and with relatively high-water content
- ✘ Low environmental impact
- ✘ Acceptance of/ demand for the output from a technical point of view
- ✘ Economically viable
- ✘ Easily implementation in low-tech environments

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STEM Challenge 7

Develop an eco-friendly solution for apple harvesting avoiding fruit or tree damage without the use of human force

BAYER

PROPOSAL REASONING

The automation of apple harvesting will enable the improvement of work in many fruit farms, contributing to the optimization of the fruit picking process, and reducing high workload of actual physical work and costs

INNOVATIVE ASPECTS TO BE VALUED

- ❑ Easy-to-use device
- ❑ Eco-friendly solution
- ❑ Ability to remotely supervise the work
- ❑ Possibility of remote control of the device
- ❑ Application of AI/ machine learning systems

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STEM Challenge 8

Create an interactive solution to improve and maintain the mental health of young adults through self-care, using a multi-sectoral and integrated approach

BAYER

PROPOSAL REASONING

Mental health is important for our overall health condition. Whether we focus on mindfulness and self-esteem or psychological disorders, preventing or healing or on promoting the importance of mental self-care, we must remember that investing in mental health requires a multi-sectoral and integrated approach

INNOVATIVE ASPECTS TO BE VALUED

- ❏ Interactive tool to increase user's engagement
- ❏ Integrate custom activity tracking and summary reports
- ❏ Targeted audience: young adults (students, people on the beginning of their career path)

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STEM Challenge 9

Build up a universal 'smart' monitoring system for public transportation that integrates real-time passenger and service information to better meet citizen needs and improve security

TRAMWAJ
FORDON

PROPOSAL REASONING

The monitoring systems in public transport are currently focused on passenger counting using sensors that identify the movement in the door area of the means of transport, which does not provide sufficient level of security. In addition, the exchange of passenger usually takes place in a disorderly manner, resulting in counting the same person several times

INNOVATIVE ASPECTS TO BE VALUED

- ✘ Universal solution for all types of public transport (rail, metro, buses and streetcars)
- ✘ Beneficiaries are operators and providers of public transport services
- ✘ Integrate nature system linked to external systems, e.g., emergency systems
- ✘ Improve the comfort of the ride

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STEM Challenge 10

Design a solution to improve robustness, flight capability, and bad weather-resistance of UAV/drones used for long-term surveillance of wildfires

GEOSENSE

PROPOSAL REASONING

Cutting-edge unmanned aerial systems (UAV/drones) are more than important in order to survey the pathways of wildfire for preventing and even suppressing the phenomenon. However, the major problem of these systems is the sustainability in bad weather conditions and especially in very strong winds, significantly reducing drone flyability

INNOVATIVE ASPECTS TO BE VALUED

- ⌘ Improve median global flyability (20-12 h/day)
- ⌘ Increase the fire detectability of the drone for surveillance

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STEM Challenge 11

Develop any system or tool to improve the recovery, recycling, and reuse of plastic municipal waste

**S.C. APA SERV
VALEA JIULUI**

PROPOSAL REASONING

One of the global environmental problems is pollution of water and soil with waste and, especially, with plastic waste. These wastes pollute not only the quality of water and soil but also the aquatic and terrestrial flora. The challenge is to recover this waste and incorporate it into a technological process that has benefits in new series of materials by capitalizing on and using them

INNOVATIVE ASPECTS TO BE VALUED

- ❏ Be focused on plastic householding waste
- ❏ Transform useless plastic waste into a material that can be easily used in other fields

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STEM Challenge 12

Development of a system to automatically detect and recognize LED displayed errors in the production process of LED display boards

ENTE

PROPOSAL REASONING

The production process of LED boards requires automatic assistance in detecting production errors, such as faulty diodes, short circuits on PCBs and driver errors. The system will speed up the quality control

INNOVATIVE ASPECTS TO BE VALUED

- ✘ Use of image processing to detect errors
- ✘ Automation of the error detection process and software validation

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STEM Challenge 13

Development of a behavioral scoring system, based on users' behavioral data, to improve the availability of financial products for clients

EPEER

PROPOSAL REASONING

Epeer is an innovative platform that uses AI to connect investors and borrowers on a website and mobile application. The development of models based on user's behavioral data, such as interest, location, structure of residence, etc. will improve effectiveness of scoring system and the availability of financial products for people without a credit history

INNOVATIVE ASPECTS TO BE VALUED

- ✘ Application of advanced methods of analysis and data normalization to data mart
- ✘ Integration of user clustering methods based on the objective function
- ✘ Usage of AI for prediction of repayment
- ✘ System scalability in relation to a variety of objective functions

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STEM Challenge 14

Development of a production method for sustainable structural materials using hazardous by-products, such as by-products of non-organic chemistry industry

GESTO

PROPOSAL REASONING

Usage of industrial by-products in construction materials is well known. The immobilization of hazardous by-products, like by-products of non-organic chemistry industry within construction material matrix, in this number alkali-activated materials, reduces environmental impact – by eliminating hazardous substances, reducing the use of nonrenewable resources, CO₂ emission by lack of cement and negative environmental impact

INNOVATIVE ASPECTS TO BE VALUED

- ❑ Economically viable process
- ❑ Stable product, requiring low energy and water use
- ❑ The process must ensure the long-term immobilization of hazardous by-products
- ❑ New product with environmental and economical advantages

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STEM Challenge 15

Development of a scheme for injector diagnostic to identify problems with injector failures in car systems

GLADYSEK

PROPOSAL REASONING

In a piezoceramic injector there is a high dependence of the piezoelectric stack resistance on the applied voltage. When a voltage greater than 100 V is applied, the measured resistance decreases and is not greater than several kms. When piezoelectric stacks are cut, ceramic deformations become visible, including longitudinal and transverse cracks of the structure, probably due to corrosion, material defects, mechanical strains and wear. However, the real reason and the physical phenomenon accompanying these changes are unknown

INNOVATIVE ASPECTS TO BE VALUED

- ✎ Enhance the understanding of complex issues behind the design and operation of vital car parts
- ✎ Valuable information to be included:
 - ✎ Measurements in situ
 - ✎ Measurements of injector components
 - ✎ Suggestions of original diagnostic methods
 - ✎ Test results

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STEM Challenge 16

Implementation of a MQTT protocol on an industrial computer in order to acquire measurement data from Landys+Gyr ZMD 405CT energy meters connected to the computer via serial ports (RS232, RS485)

JSWIT

PROPOSAL REASONING

Many branches of industry are based on distributed systems that use communication protocols to connect multiple devices that work together as one organism. Expansion of production plants causes the demand for reliable exchange of large amounts of data between devices. It has a measurable impact on the reduction of costs resulting from utility charges and improvement of the company's ecological indicators

INNOVATIVE ASPECTS TO BE VALUED

- ❏ Support for multiple energy meters
- ❏ Queuing access to serial ports
- ❏ Providing data access to two independent applications – one using the MQTT protocol to provide data to SCADA application, and the other application using its own communication protocol

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STEM Challenge 17

Development of an electric and magnetic field arm scanner

**ROCKWELL
AUTOMATION**

PROPOSAL REASONING

In order to understand the EMC behaviour and performance of the electronic circuit it is crucial to know which of its components radiates emissions and which are out of concern. This information give to the designer valuable information about parts of the circuit that require investigation in case of circuit EMC debug

INNOVATIVE ASPECTS TO BE VALUED

- ❏ Two degrees of freedom
- ❏ Communication with a spectrum analyzer
- ❏ Data visualization
- ❏ Scan area definition procedure
- ❏ Users should be able to define scan resolution

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STEM Challenge 18

Development of a sustainable process for the purification of (2S,3S)-2-benzhydryl-3-benzylaminoquinuclidine from other isomers which are created during its synthesis in veterinary and antiemetic drug industries

SYNTAL

PROPOSAL REASONING

Green chemistry focused on the design of products and processes that minimize or eliminate the use and generation of hazardous substances, including reducing consumption of non-renewable resources and technological approaches for preventing pollution. The company Syntal is working under the improvement of technological approaches for synthesis of fine chemicals according to green chemistry rules and with the agreement with economy

INNOVATIVE ASPECTS TO BE VALUED

- ❏ New product with high purity (at least 80% of enantiomeric excess)
- ❏ Usage of safe reagents
- ❏ Increase the sustainability of technology with significant environmental benefits
- ❏ Well-defined operating conditions

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STEM Challenge 19

Create a system that manages the legalization (Industrial Safety, Environment and Occupational Risk Prevention), both initial and subsequent, of all types of installations involved in the operation of a building or facility

GLOBAL
VIRTUALIZZA

PROPOSAL REASONING

The large amount of legislation that currently affects public entities as private companies (industrial safety, environment, occupational risk prevention, etc.) and its frequent changes, means that they do not have under control their compliance and the documentation that proves it, being outside the law.

INNOVATIVE ASPECTS TO BE VALUED

- ✎ The solution should be put into practice through computer applications and technological resources.

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