



STEMATHLON

INTERNATIONAL CONTEST



Panhellenic STEM and Educational Robotics Competition

STEMAthlon 2027

Competition category: Open Category, Grades 4–6 of Primary School

Competition title: From Human to Artificial Intelligence – Our Life in 2040

Version: 1.0

Category coordinator:

. Summary

This document describes the Panhellenic STEM and Educational Robotics Competition STEMATHlon 2027, on the theme **“From Human to Artificial Intelligence – Our Life in 2040.”** The competition is aimed at students in Grades 4, 5 and 6 of primary school and seeks to engage them in designing the future, emphasising that artificial intelligence is already present in our lives and that what matters now is **how people respond to it: lifelong learning and creative adaptation.**

The challenge for participants is to choose one of fourteen thematic areas of everyday life and create a project that proposes what this activity will look like in 2040, with solutions in which artificial intelligence works together with people and meets a real need.

Participants are divided into two difficulty subcategories: Elementary and Advanced. Each subcategory has specific automations that must be implemented (E1 and E2 for Elementary; E1, E2, A1, A2 and A3 for Advanced).

The suggested materials are compatible with robotics systems already available in schools (e.g. Micro:bit, Nezha Inventor's Kit, WeDo, GIGO, S1). Automations E1 and E2 require at least one sensor, a processor and an actuator; they are assessed on successful operation, originality and their meaningful contribution to the project.

Automations A1 and A2 (for the Advanced subcategory) involve taking measurements of physical quantities with sensors, displaying them on a real-time graph, and activating motors based on a threshold. The mechanical constructions driven by these automations carry increased weight in the assessment.

Automation A3 focuses on the use of a camera with Artificial Intelligence (AI) technology for image pattern recognition and activation. It aims to familiarise students with AI, model training, its applications and its ethical aspects.

Finally, a digital project documentation portfolio is required (Deliverable 2), which includes parental consent forms, a short project description, programming files, photos of the construction and a demonstration video.

A. Description

From Human to Artificial Intelligence: Our Life in 2040

For years we debated whether and when artificial intelligence would enter our lives. Today, that debate is over. Artificial intelligence is already here – in the phones we hold, in search engines, in hospitals, in the fields, in cars, in the classroom. It is not something that is coming; it is something we are already living with. And that is exactly why the real question of this year's competition is not "how will artificial intelligence enter our lives", but something far more human: **how will we stand in relation to it?**

Because the problem of our time is no longer the technology itself. It is our attitude towards it. Some fear it, some ignore it, and others think it will do everything on its own. And amid all this, one anxiety that defines our era is heard loud and clear: "artificial intelligence will replace us at work."

In this competition, we want to offer a different answer. The machine does not take the place of the person who keeps on learning. The big challenge of 2040 is not who knows the most today, but who is ready to learn again tomorrow. This is called lifelong learning – and it is the most powerful tool people have to avoid being left behind. Those who learn, adapt. And those who adapt are not replaced; they evolve alongside technology and steer it to where it is needed.

But adaptation is not only about work. It concerns our whole life. How will we learn? How will we travel, have fun, look after our health, protect the planet, communicate with each other, play sports? In each of these everyday activities, 2040 will find us changed – if we choose to adapt creatively. That is exactly why we have divided the future into fourteen areas of our lives: from education, work and the economy to culture, tourism, the environment, health, transport, safety and sport. Choose one – and redesign it.

This year's competition does not ask children to guess the future. It asks them to build it. To observe a need in everyday life, to imagine what it will look like in 2040, and to propose a solution in which artificial intelligence works for people – and not the other way round. Because at the centre, always, remains the human being: the one who asks questions, who cares, and who never stops learning.

The fourteen thematic areas

Each team chooses one of the following areas and builds its project scenario and model around it.

1. Education in 2040

From the same pace for everyone to learning that adapts to each child. Digital "mentors" that help, classrooms that sense when they need light or ventilation. The teacher is not replaced – they gain time for what they do best: inspiring.

2. Culture & the Arts in 2040

Museums that come to life, artworks restored digitally, antiquity in three dimensions. Artificial intelligence preserves and spreads our culture, but the creative voice remains human.

3. Work & Professions in 2040

Humans and machines as partners, not competitors. Professions that do not exist today, and skills gained through continuous learning. The question is not "who will take our jobs" but "what new things can we learn."

4. The Economy & the Marketplace in 2040

Smart shops, fair management of resources, automatic restocking. Technology simplifies transactions, but decisions about what is fair remain with people.

5. Entertainment & Leisure in 2040

Interactive games, smart playgrounds, new forms of entertainment. Technology multiplies our options – as long as we use it to live more, not less.

6. Human Relationships & Communication in 2040

Artificial intelligence that breaks down language barriers and keeps people close across distances. The question that remains open: does technology bring us together or isolate us? The answer depends on us.

7. Politics & Citizen Participation in 2040

More direct participation, transparency, better information. Technology gives citizens tools, but the responsibility for decisions remains deeply human.

8. Tourism & Travel in 2040

Digital tour guides, accessibility for all, showcasing places without overtourism. An ideal field for Greece: monuments and landscapes that “speak” to every visitor in their own language.

9. The Environment & Climate in 2040

Sensor networks that monitor pollution, fires and water; artificial intelligence that predicts and protects. Technology gives us the eyes – caring for the planet remains our responsibility.

10. Food & Agriculture in 2040

Vertical farms in the city, smart irrigation, zero food waste. From farm to plate, artificial intelligence helps feed more people with fewer resources.

11. Health & Wellbeing in 2040

Preventive monitoring, assistive technology for people with disabilities and the elderly, hospitals that provide better care. The machine measures and alerts – people heal and care.

12. Transport & the Smart City in 2040

Autonomous vehicles, smart traffic lights, deliveries without traffic jams. Cities that “think” about their flow – yet designed around human needs.

13. Safety & Civil Protection in 2040

Early detection of hazards, smart disaster management, faster help where it is needed. Artificial intelligence buys precious time – people make the critical decisions.

14. Sport in 2040

Data-driven training, injury prevention, sport accessible to everyone. Technology improves performance, but passion and effort remain purely human.

Pedagogical rationale

This year’s theme shifts the question from “what is artificial intelligence” to “how do people learn to live and create alongside it.” In a world where knowledge and tools are renewed faster than ever,

the most resilient skill is not a specific piece of technical knowledge but the very ability to learn throughout life and to adapt – what international frameworks call “learning to learn” and recognise as a fundamental competence for personal and professional life (European Commission, 2018; OECD, 2018). At the heart of this approach lies human agency: the student's ability to act purposefully, make decisions and shape the future rather than passively endure it. The competition builds on exactly this principle, turning anxiety about automation into a creative challenge: students are not asked to predict 2040 but to design it, identifying where people – through critical thinking, collaboration and continuous learning – remain irreplaceable alongside the machine.

B. The Challenge

Encourage the children to observe an activity from our everyday life – education, culture, work, the economy, entertainment, communication, citizen participation, tourism, the environment, food, health, transport, safety or sport – and to imagine what this activity will look like in 2040.

The challenge for participants is **to create a project that proposes a way for people to adapt to the new reality**: a solution in which artificial intelligence works together with people, meets a real need and improves our quality of life. The goal is not to predict the future, but to design it.

Help them understand that artificial intelligence is no longer something that is coming but something we already use, and that the real challenge is lifelong learning: people's ability to learn again, to adapt, and to remain the ones who set the goals and make the decisions.

What will be assessed

- Functional representations of smart, original and, as far as possible, applicable solutions
- Demonstration of a fully functional project according to the specifications
- Autonomous operation of the model
- A proper presentation of the project, which will include:
 1. Oral presentation by the team members in a spirit of collaboration
 2. Correct answers to the judges' technical questions
 3. Complete project documentation with printed or digital supporting material

C. Participants & Teams

Difficulty levels

Taking into account that many teams are taking part in this competition category for the first time, projects will be divided into two assessment subcategories, each with a different level of difficulty, depending on the automations that participating teams decide to implement.

The two subcategories are Elementary and Advanced, and they differ in terms of the automations required.

Teams taking part in the **Elementary subcategory must implement automations E1 and E2.**

Teams taking part in the Advanced subcategory **must implement automations E1, E2, A1, A2 and A3.**

Note: The two subcategories are Elementary and Advanced, and they differ in terms of the automations required. Elementary: E1 and E2. Advanced: E1, E2, A1, A2 and A3.

D. Materials and Equipment

Suggested competition materials

The materials suggested for implementing the automations are those that schools have acquired over time through robotics equipment programmes and that are compatible with the software permitted in this competition category. The materials are described in the following tables.

Suggested materials compatible with the Micro:bit processor

Code	Product	Link
729039	Micro:bit v2 board	View on why.gr
708232	NEZHA Inventor's Kit for micro:bit	View on why.gr
708288	NEZHA Inventor's Kit for micro:bit v2	View on why.gr
708413	Nezha Pro – Micro:bit Space Science Kit	View on why.gr
708239	32 in 1 micro:bit Wonder Building Kit	View on why.gr
705045	Smart AI Lens Kit Module	View on why.gr
—	PlanetX modules – compatible with Nezha and TPBot	View on why.gr
777784	STEM Programming S1	View on why.gr
708232R	Bricks Set for the S1 system and Nezha V1	View on why.gr
710155	Geekservo 360 Degrees (angular positioning)	View on why.gr
710156	Geekservo Continuous Rotation 360 Degrees	View on why.gr
710154	Rotational DC Motor	View on why.gr
—	Octopus modules – compatible with Micro:bit, with universal 3-pin SVG connector	View on why.gr
703406	Micro:bit Motor:bit	View on why.gr
708207	micro:bit Wukong Expansion Board Adapter	View on why.gr
941269	Gigo Micro:Bit Compatible Robots	View on why.gr

WeDo 2.0 (or compatible) sensors and motors

Code	Product	Link
745301	Smarthub 2	View on why.gr
745303	Medium Motor	View on why.gr
745305	Tilt Sensor	View on why.gr
745304	Motion Sensor	View on why.gr
777710	My First Automations	View on why.gr
777710R	Refill Pack for “My First Automations”	View on why.gr

E. Deliverables

Deliverable 1 – Fully Functional Model (assessment day)

Help the children create a fully functional project (model) that presents the problem and the proposed solution, incorporating the automations required by the competition rules. Prepare the children for a team presentation of the project that is clear and easy to follow on the day they present to the judges.

Ideally, the model should operate fully autonomously. The scenario or scenarios included in the children's project should run and unfold completely autonomously. It is recommended that only the start of the project's operation involves human interaction, and that this interaction is simply pressing a button, either physical or digital. The autonomy of the project's overall operation is also one of the assessment criteria.

The project model

On assessment day, the team must present a fully functional model representing the scenario it has worked on. In this project, students will use automations and artificial intelligence to showcase issues that inspired them and solutions they propose for the future they are going to build.

The project should be supported by a "scenario narrative" that takes place in a particular setting. This setting will be represented in the project by a model that forms the backdrop into which the automations are integrated. On competition day, each team will be given a "booth" with a floor area of approximately 150 cm × 150 cm and a vertical back panel approximately 2 m high. Printed material can be attached to the back panel, or the presentation can be projected onto it (using the team's own projector). The booth will have a workbench measuring approximately 100 cm × 60 cm. The model, together with the automations, must be set up in this space. Alternatively, the team may place its project on the floor, provided it does not extend beyond the booth's boundaries. A power supply with a multi-socket extension will be provided in the booth. There will be no wired internet or Wi-Fi.

Model materials

The robotics systems available in schools for this age group that allow the building of free-form, precision mechanical constructions are either Lego-type or GIGO-type. Given this, all parts of the construction that contain mechanical automations or motor-driven mechanical parts must be built with Lego, WeDo or GIGO-type plastic building elements. The remaining parts of the construction may be made of any other material (such as foam materials, paper, wood, etc.), provided it poses no risk to the children.

The model's automations – Automations E1 and E2

Both teams in the Elementary subcategory and teams in the Advanced subcategory must present the two electronic automations E1 and E2, based on one of the suggested material systems associated with this competition category, as listed in the relevant section of this document.

- Each automation includes at least one sensor, the processor and at least one actuator (LED, relay, DC or servo motor, buzzer, etc.).

These automations are assessed on:

- Successful operation

- Originality of the automation
- The automation's meaningful contribution to the functionality of the project

The children should be able to describe how the materials involved in the automation work.

Automations A1, A2 and A3

Automations A1, A2 and A3 are required, in addition to E1 and **E2, only from teams wishing to compete in the Advanced subcategory.**

Automations A1, A2 and A3 may be implemented **only in a programming environment based on MIT Scratch** (e.g. Scratch 3, Mind+, e-code) **or in the MakeCode programming environment.** For automation A3 specifically, AI software tools may be used, as described in the relevant section.

Automations A1 and A2

Teams taking part in the Advanced subcategory must present the two electronic automations A1 and A2, based on a system with a Micro:bit processor unit or on the S1 automation system, according to the following requirements:

- Each automation includes at least one sensor, the processor and **at least one motor.**
- The sensor of each automation **takes measurements of a physical quantity.**
- The sensor is either an internal micro:bit sensor or an external sensor.
- The measurements of the physical quantity **are displayed on a computer screen as a real-time graph.**
- Each automation **is activated after comparing the sensor measurement with a specific value of the physical quantity (threshold).**
- The physical quantities measured and used in automations A1 and A2 **must be different from each other.** The mechanisms or robotic systems associated with the actuator motor **must also be different from each other.**
- In both automations A1 and A2, **the motor that is activated must drive a mechanical construction with a specific function, or be part of a robotic system that includes a mechanical construction with a specific function in the project.** The use of simple machines (wheel, screw, pulley, gear, lever, inclined plane, wedge) is required in every case. The two robotic or mechanical constructions also form part of the assessment and carry increased weight.

We would like as many of the systems already available in schools as possible to be used in the competition; for this reason, we recommend software with high interoperability between systems (Mind+, e-code, MakeCode).

These automations are assessed on:

- The **originality** of the automation
- The correct **measurement and use of the physical quantity** associated with the sensor
- The mechanical construction or the construction of the robotic system **that includes the motor – actuator of the mechanism**

The graph may be generated automatically by the programming environment (e.g. MakeCode), created through code (e.g. in a Scratch environment) or produced with a suitable data-visualisation application. In any case, students **must be able to interpret the graph and the change in the physical quantity, and explain how they send the data to the graph and display it.**

For example, the following can be used to measure and graph the physical quantity:

- Micro:bit with an internal sensor
- Micro:bit with an external sensor and an expansion board (e.g. Wukong, Motor:bit)
- Nezha system (Micro:bit)
- Gigo Robots system (Micro:bit)
- Wonder Building Kit system
- S1 system

To create a robotic system/mechanism, the following systems can be used:

- Nezha system
- Gigo Robots system
- Wonder Building Kit system
- S1 system (with additional building elements and motors)
- WeDo system or compatible

The S1 system in particular, which has no building elements, can be used to measure the physical quantity and send an activation command to one of the WeDo or Gigo Robots robotics systems, which allow mechanisms to be built. The Mind+ software can be used to achieve this combination.

Also, specifically for the S1 system, if the team does not have any of the above educational robotics systems, we recommend using the building elements of the Bricks Set S1 and Nezha V1 package for the mechanical/robotic construction, together with the 710155 Geekservo 0–360 Degrees (angular) and/or 710156 Geekservo Continuous Rotation motors and the Mind+ software. These building elements are plentiful, well suited to developing mechanisms and come with many examples. The recommended motors can be driven directly by the S1 system and are fully compatible with the building elements mentioned above.

Finally, within the scope of the required automations, the sensors of the S1 system can be used with the Gigo Robots and Wonder Building Kit systems.

The educational benefits of electronic measurement of physical quantities

Alongside the knowledge the children gain about the scientific field their project topic relates to, the required automations A1 and A2 are an excellent opportunity to teach the following concepts:

- Analogue and digital signals; digitisation of analogue quantities found in nature
- Units of measurement
- Measurement scales
- Application of the concept of proportion taught in primary school
- Measurement errors
- Change of physical quantities as a function of time
- Cartesian coordinate system and graphs
- Dependence of physical quantities on other physical quantities

Automations A1 and A2 help children gain an in-depth understanding of how the modern electronic devices around us use electronic sensors to examine their surroundings and make decisions that are useful to us.

Automation A3 – Use of an AI camera

Automation A3 is an automation that uses a camera as its sensor and must use AI technology. There are usually two possible implementations, and both are acceptable. The first involves using a camera with built-in AI technology, such as the Smart AI Lens Kit and HUSKYLENS. The second involves using a simple computer or smartphone camera in combination with an AI application that can communicate with the processor involved in the automation. A typical example of this implementation is using the capabilities of the Google Teachable Machine website, or the AI Image Recognition internet extension in the Mind+ environment.

This automation is implemented by recognising image patterns in the camera's captures and then triggering an actuator.

The educational goal of automation A3 is for students to come into contact with AI technology: to understand what artificial intelligence is, the need to train an AI model, the ways the technology can be used, and the likelihood of correct and incorrect recognition depending on how well the AI algorithm has been trained.

Through this automation, the teacher has an excellent opportunity to inform students about AI technology and its capabilities, to inspire them with useful applications that will benefit people, and also to make them aware of the potential for irresponsible use and the need to establish rules.

Deliverable 2 – Project Documentation (10 working days before the assessment)

Help the children create a digital portfolio documenting their project, and share the electronic material according to the relevant instructions. Each team must submit electronically:

1. Parental consent forms for the use of photos or videos in which the children's faces are visible (special printable forms that will be posted on the competition website).
2. A short description of the project (Word document) highlighting the problem it solves.
3. The program file(s) in Scratch and/or Mind+ and/or MakeCode.
4. Photos showing the stages of building the project, especially the construction of the mechanisms.
5. A video in which the students present the construction, describing and demonstrating how it works, with emphasis on the automations in operation (zoom in so that the automation is visible). The video must not exceed 100 MB. Please note: projects whose video exceeds 100 MB will not be included in the portfolio assessment process.
6. Optionally, the file with the pseudocode/code outline (in xls, pdf, png or jpg format) or any flowchart or state diagram the teacher considered necessary for analysing and understanding the project's code.

It is the coach's responsibility to submit the portfolio electronically and on time, by a specific date announced by STEM Education (at least 10 days before the team takes part in its regional competition). For projects submitted late, it is at the discretion of the Judging Committee to decide whether they will take part in the Competition and be assessed.

The students' presentation of the project

On the day of the Competition (Regional or Final), teams must:

- set up the model, automations and scenery – transported pre-built and pre-assembled – in the “booth” assigned to them;
- ensure that the set-up complies with the regulations;
- demonstrate and present their project to the public (if asked).

Limited time is available to each team for the judging of projects (this is a compromise between the number of teams and the total assessment time available). As an indication, this time may be seven minutes, part of which – e.g. five minutes – will be for the presentation and the rest for questions from the judges.

During the judges' assessment of their project, teams present their work by narrating their “innovative idea” and their invented scenario in a “theatrical way.” The presentation may be supported either by a short printed handout or by a PowerPoint presentation outlining the main features of the project.

In a spirit of teamwork, each team member, according to the role they played during the development of the project, takes the floor and:

- explains how their project relates to the theme of the competition;
- narrates the “scenario” on which the project is based and guides the judges around the model;
- explains how the automation solves the problem in question;
- demonstrates the automations in operation;
- explains the code of the automations, how the sequence of measurements is taken, and how the camera-based AI automation works.

F. Assessment

Indicative assessment criteria for projects

The way the Competition is run is a living process that evolves from year to year. In particular, the Attica Regional Competition, because of its very large number of participants – which disproportionately increases the complexity of managing it – presents particular challenges and is often used as a pilot for organisational changes to the Final Competition. Throughout the years the competition has existed, the procedures by which it is run each time have been continuously analysed; concerns are raised, improvements are proposed, innovations are adopted and, once checked for feasibility, tested in practice.

In the Competition, projects are assessed by judging panels that are normally made up of experienced teachers specialising in STEM education and educational robotics.

Each panel consists of 2 to 5 judges, who rank the projects of the teams assigned to them. In competitions where teams take part in the final stages, the teams being judged are assessed by the same panel. In such competitions, in addition to the judging panel that assesses for the medals, there is often another panel that assesses for the individual thematic awards.

When assessing for the medals, judges may consult the following rubric.

Rubric (scoring guide) with indicative assessment criteria

CRITERIA	SUB-CRITERIA	POINTS
Research / Idea Conception	TOTAL POINTS	60
1. Research and idea development		20
2. Soundness of the reasoning used to solve the challenge – feasibility		20
3. Multi-faceted development of the topic / Completeness		20
Constructions, Mechanisms, Automations	TOTAL POINTS	270
1. Artistic appearance of the model, representation of the environment		40
2. Mechanical constructions, use of simple machines, correct operation		20
3. Automation E1	Correct operation	10
	Originality	10
	Meaningful use / Problem solving	10
4. Automation E2	Correct operation	10
	Originality	10
	Meaningful use / Problem solving	10
5. Automation A1	Correct measurement / use of physical quantity 1	10
	Originality	10
	Mechanical/robotic construction related to the actuator motor	20

CRITERIA	SUB-CRITERIA	POINTS
6. Automation A2	Correct measurement / use of physical quantity 2	10
	Originality	10
	Mechanical/robotic construction related to the actuator motor	20
7. Automation A3 – AI Camera	Correct operation	10
	Originality	10
	Smart use / Problem solving	20
8. Autonomous operation of the model	Fully autonomous operation of the scenario described in the model	30
Knowledge – Understanding	TOTAL POINTS	90
1. Understanding of the scientific concepts related to the project		30
2. Good knowledge of the code, team's response to related questions		30
3. Understanding of basic artificial intelligence concepts		30
Presentation	TOTAL POINTS	60
1. Communication skills – Expression		10
2. Participation of all members		10
3. Collaboration		20
4. Clarity of description		10
5. Decoration, Video, Posters		10
MAXIMUM SCORE		480

G. Team Rankings – Awards

General and Special Awards per subcategory

Advanced project awards

The Advanced subcategory leads to the following General awards:

- Gold Advanced (3 teams)
- Silver Advanced (3 teams)
- Bronze Advanced (3 teams)

The Advanced subcategory also leads to Special awards, which will be announced in a later version of this document.

Elementary project awards

The Elementary subcategory leads to the following General awards:

- Gold Elementary (3 teams)
- Silver Elementary (3 teams)
- Bronze Elementary (3 teams)

The Elementary subcategory also leads to Special awards, which will be announced in a later version of this document.

H. Complaints and Appeals Procedure

The “cascade process” followed in the Competition does not allow for delays and, because of this, it is not possible to implement an appeals procedure effectively during the competition.

Objections, complaints, appeals and suggestions – in writing – are accepted, evaluated and used by the competition's scientific and organising committees for the continuous improvement of future competitions.

In our experience, the few objections regarding the assessment have arisen from a misunderstanding of the competition rules – as a rule on the part of those who raised them, perhaps understandably.

Because of the open nature of the competition, the assessment involves factors that do not allow for a weighted and “objective” score for non-measurable (but recognisable) qualities of the participants' projects, such as originality, aesthetics, presentation, etc. Therefore, since the very first competition – although a rubric with weighted scoring is used as a guide – a “cup” model has been adopted, in which the winner emerges through successive eliminations, instead of a “league” model, in which the champion is determined by the points accumulated. This “cup” model is adopted in the assessment phases, in which groups are formed (the groups of teams that each panel will assess). The rubric may serve as guidance for the judges on the panels.

The physical proximity of teams belonging to different groups, and comparisons between them, can lead to complaints of unfair treatment. Placing teams in the various groups as randomly as possible is something that objectively cannot be avoided, and it is the duty of team coaches to understand this way of working and to explain it to the children in their teams and to their parents.

What matters most, as a personal reflection, is for each child to compare themselves with who they were before getting involved in the competition process: what they have achieved for themselves and how they have grown through taking part in the competition.