

CAREKATHON

ENGINEERING ASSISTIVE SOLUTIONS FOR BETTER LIVING

E • • ESCUELA DE
INGENIERÍAS
INDUSTRIALES

S FACULTAD DE
CIENCIAS DE LA SALUD



ENGINEERING



DESIGN



ADVANCED
MANUFACTURING



SOCIAL
IMPACT



October 29th
November 5th – 6th
2026

Patrocinan



Colegio Oficial de Ingenieros Industriales
de Andalucía Oriental



COPITI
Colegio Oficial de Peritos e Ingenieros
Técnicos industriales de Málaga

 **Grupo
LOGSA**
Medical Devices

 **novaindef.**
Ingeniería Defensa & Espacio

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CAREKATHON

Engineering Assistive Solutions for Better Living

1. Motivation

CAREKATHON is an international hackathon organized within the framework of the **UNINOVIS** alliance and its Data for Life initiative, bringing together students, researchers, and professionals from diverse disciplines to address real societal challenges through engineering and innovation.

Coordinated by **Universidad de Málaga**, through the **Escuela de Ingenierías Industriales** and the **Facultad de Ciencias de la Salud** and developed in collaboration with **Tampere University (Finland)** and **Technische Hochschule Würzburg-Schweinfurt (Germany)**, CAREKATHON represents a truly European initiative that promotes multidisciplinary collaboration in engineering, healthcare, digital manufacturing, and social innovation.

The motivation behind CAREKATHON lies in a simple but powerful idea: engineering can significantly improve people's lives when technology is designed around real human needs. Beyond technical performance, innovation should contribute to autonomy, inclusion, dignity, and wellbeing.

Through a real **user-centred challenge**, participants will be invited to design and prototype assistive solutions capable of **addressing daily-life limitations** faced by people with functional disabilities. By combining creativity, technical knowledge, empathy, and rapid prototyping technologies such as 3D printing, teams will develop practical solutions with tangible social impact.

CAREKATHON seeks not only to promote technological innovation, but also to cultivate a new generation of engineers and health professionals capable of working collaboratively to solve complex human-centred challenges. In this context, data, design, and engineering become powerful tools for improving quality of life and building a more inclusive society.

2. The Challenge: Pedro's Case

At the heart of CAREKATHON lies a real human challenge: **helping Pedro** regain autonomy in his daily life through accessible engineering solutions. Pedro is a 40-year-old father of two who, following a severe septic shock, underwent the amputation of all fingers on both hands and toes on both feet. Before this life-changing event, he worked as a painter and handyman, leading an active, independent, and highly practical life.

Today, Pedro faces significant limitations in performing many **everyday activities** that most people take for granted. Simple actions such as eating, holding objects, writing, using a mobile phone, carrying items, or performing household tasks now require considerable effort, adaptation, or external assistance.

Despite these challenges, Pedro has shown remarkable resilience and determination. Through occupational therapy, he has developed compensatory strategies that allow him to interact with objects using the residual thumb area and both palms together. Importantly,

he retains good strength and mobility in his shoulders, arms, and wrists, including functional flexion, extension, and rotational movements.

These remaining physical capabilities provide a strong foundation for assistive engineering interventions. Rather than replicating a full hand prosthesis, the challenge focuses on designing practical, low-cost assistive devices that leverage Pedro's existing mobility to restore functional autonomy.

Participants are therefore invited to identify unmet daily needs and transform them into meaningful engineering solutions. The ultimate goal is not simply to build a device, but to enable Pedro to **recover independence, confidence, and quality of life**. Pedro's case represents an ideal challenge for multidisciplinary innovation, combining engineering design, healthcare, ergonomics, and additive manufacturing to generate solutions with real and immediate social impact.



3. Objectives of the Competition

CAREKATHON aims to challenge participants to develop innovative, practical, and user-centred assistive solutions that address real functional limitations in daily life. The main objectives of the competition are:

- **Promote human-centred engineering innovation** by designing solutions focused on real user needs and everyday challenges.
- **Develop assistive devices that enhance functional autonomy**, enabling Pedro to perform daily activities with greater independence and confidence.
- **Encourage multidisciplinary collaboration** between students and professionals from engineering, health sciences, design, and related disciplines.
- **Apply rapid prototyping and digital manufacturing technologies**, particularly 3D printing, to transform ideas into feasible physical solutions.
- **Foster creativity under real-world constraints**, balancing functionality, ergonomics, manufacturability, safety, and cost-effectiveness.
- **Generate socially impactful solutions** that improve quality of life and may inspire broader applications for other users with similar disabilities.
- **Strengthen international collaboration** among participants from Spain, Finland, and Germany within the UNINOVIS alliance.

Ultimately, the competition seeks to demonstrate how engineering, empathy, and innovation can come together to create meaningful technological solutions with direct human impact.

4. Challenge Areas

Participants will be invited to develop practical assistive solutions addressing specific daily-life challenges faced by Pedro. Each challenge focuses on restoring functional autonomy in meaningful personal, family, and professional activities.

The proposed challenge areas include:

1. Baby Care Assistance

Design an assistive device that enables Pedro to safely hold and manipulate baby-care items, such as feeding bottles, while caring for a child. Solutions involving forearm-mounted supports are particularly encouraged, as they may free the wrist and palm for additional movement and stability while holding the baby.

2. Leisure and Family Interaction

Develop devices that facilitate recreational activities with Pedro's nine-year-old daughter, promoting shared leisure and emotional connection. Possible examples include an adapter for a table tennis racket or an ergonomic interface for operating a PlayStation controller.

3. Household Task Support

Create assistive adaptations that enable Pedro to participate more independently in household chores. Examples include forearm-mounted or wearable interfaces for handling a dustpan, mop, brush, or similar cleaning tools.

4. Professional and Work Tool Adaptation

Design functional adapters that allow Pedro to use work-related tools associated with manual activities. Potential applications include pruning shears, paint rollers, brushes, or other hand-operated tools requiring grip and force transmission.

5. Kitchen and Food Preparation Assistance

Develop solutions that improve Pedro's autonomy in kitchen-related activities, such as cutting food, stirring ingredients, stabilizing containers, handling kitchen utensils, or moving products from the refrigerator. Devices should prioritize safety, ergonomics, and ease of cleaning.

6. Writing and Fine Manipulation Support

Design assistive solutions for tasks requiring fine motor control, such as writing, helping his daughter with schoolwork, or interacting with small mechanisms. Solutions may also address related challenges such as pressing the release button of a car seatbelt, an action that currently presents significant difficulty.

Participants may focus on one specific challenge area or propose integrated solutions addressing multiple daily-life needs. The most successful proposals will demonstrate a strong understanding of user needs, practical feasibility, and meaningful impact on Pedro's autonomy and quality of life.

Designs must follow a user-centred approach, taking into account biomechanics, comfort, skin sensitivity, pressure distribution, and ease of use. Solutions should be safe, intuitive, and adaptable to the user's specific physical condition. From an engineering perspective, the challenge involves recreating or compensating for key hand functions that have been lost, including:

- precision grip (tip-to-tip pinch)
- lateral pinch (key grip)
- cylindrical grip (holding tools, bottles, handles)
- oblique palmar grip (cutlery, writing tools)
- hook grip (carrying objects such as bags)

Possible solutions may include adaptive gripping systems, modular tool interfaces, wearable assistive structures, mechanical extensions, or hybrid devices that leverage the

user's remaining mobility. The success of each proposal will not be measured by technical complexity, but by real impact: how many daily-life activities Pedro can recover independently, safely, and with confidence.

The best entries will demonstrate a deep understanding of the user, a feasible and well-resolved physical design, and a clear contribution to restoring autonomy, self-esteem, and quality of life through accessible engineering.



(This image has been generated using AI)

5. Rules and Participation Requirements

CAREKATHON is open to students from Escuela de Ingenierías Industriales and Facultad de Ciencias de la Salud at Universidad de Málaga, as well as students from the partner institutions within the UNINOVIS alliance.

Participation is intended for **senior undergraduate students (3rd and 4th year)** and **master's students**, ensuring that participants have sufficient academic and technical background to address complex real-world challenges in engineering and healthcare.

The hackathon promotes multidisciplinary collaboration between participants from engineering and health sciences, encouraging teams to combine complementary skills and perspectives in order to develop more effective user-centred solutions.

The following participation rules apply:

- Participants must be enrolled in one of the eligible academic programmes at the participating institutions.
- Participants may register individually.
- In the event that the number of applications exceeds the available places, participant selection will be based primarily on academic performance, taking into account the applicant's academic record. When applicants have comparable academic merit, registration order will be used as a secondary selection criterion.
- All participants are expected to actively engage throughout the hackathon sessions, including workshops, mentoring activities, and final presentations.
- All solutions must be original and developed specifically during the hackathon period.
- Proposed designs must prioritize functionality, safety, accessibility, usability, and user-centred design.
- Participants are expected to contribute to an inclusive, respectful, and collaborative working environment.

Further details regarding technical submissions and final deliverables will be communicated by the organizing committee prior to the prototyping phase.

6. Team Composition

Participants will initially register on an individual basis. Teams will be formed after registration by the organizing committee, with the aim of creating balanced, interdisciplinary, and international groups.

Each participating university will form **six interdisciplinary teams**, with each team composed of **five students**, ideally including **3–4 engineering** students and **1–2 health sciences** students. This structure ensures that each team combines complementary technical and healthcare-related expertise, fostering collaboration between students with different academic backgrounds.

Although teams will initially be organized within each university, participants from different partner institutions may collaborate during joint mentoring sessions, workshops, and final presentations, promoting international exchange and knowledge sharing among students from Spain, Finland, and Germany.

7. Technical Constraints

All challenges should lead to the design and prototyping of a **physical device** aimed at improving wellbeing and functional autonomy in daily life.

Solutions must be primarily manufactured using **PLA** and standard **FFF/FDM 3D printing**. The core of the solution should be a 3D-printed product, although small additional components may be used when necessary to improve functionality, comfort, assembly, or usability.

All teams will work under a shared technical framework to ensure comparability, feasibility, and realistic prototyping during the hackathon.

The following technical constraints apply:

- The solution must be primarily based on **3D printing in PLA**.
- Each printed part must fit within the build volume of a typical desktop 3D printer, approximately **220 × 220 × 250 mm**.
- Multi-part assemblies are allowed, provided that each individual component fits within the size limits.
- **Additional non-printed components**, such as screws, elastic bands, Velcro straps, foam padding, basic electronics, or simple fastening elements, may be used only in a complementary way.
- The design should aim for **low cost, ease of fabrication, safety, comfort, and practical usability**.
- The proposed device should be suitable for **rapid prototyping** within the hackathon timeframe.
- If the final device is too large to be manufactured at full scale during the event, a **scaled prototype** may be produced, provided that the functional principle is clearly demonstrated.

The emphasis will be placed on feasible, accessible, and user-centred solutions rather than on technological complexity alone.

8. Deliverables

All teams are required to submit a set of deliverables that demonstrate both the **engineering design process** and the **practical value of their solution**. The focus should be on creating a **functional, manufacturable device using PLA and 3D printing technologies**.

4.1. Physical Prototype

Description

A **physical device**, fully or partially manufactured using **PLA and FDM 3D printing**, representing the proposed solution.

Requirements

- The prototype must be **functional or semi-functional**.
- It can include **assembled components** (e.g., screws, elastic bands, simple mechanisms).
- It must be possible to **demonstrate and explain how it works**.

Evaluation focus

- Functionality.
- Robustness.
- Ergonomics.
- Ease of use.

4.2. CAD Model (Digital Files)

Description

A complete set of digital design files of the device.

Format

- **STL (mandatory)**.
- Optional: STEP, SolidWorks, Fusion 360 or equivalent.

Requirements

- All parts of the design must be included
- Files must be **ready for 3D printing**
- Designs should be **replicable and modifiable** if possible

Purpose

To evaluate the **engineering quality and manufacturability** of the solution.

4.3. Technical Concept Sheet (1 page)

Description

A concise, structured document summarizing the project.

Required content

- Selected challenge.
- Problem definition.
- Proposed solution.
- How the solution improves Pedro's wellbeing.
- Device functionality.
- Materials and manufacturing approach.
- Advantages compared to similar solutions.

4.4. Manufacturing Sheet

Description

A brief technical summary of the production aspects of the device.

Required content

- Estimated printing time.
- Material consumption (PLA).
- Number of parts.
- Assembly process.
- Estimated cost.

Purpose

To assess **feasibility, scalability, and engineering realism**.

4.5. Final Pitch (3–5 minutes)

Format

Oral presentation supported by slides and prototype demonstration.

Recommended structure

1. Problem
2. Proposed solution
3. Prototype demonstration
4. Value and impact

Support material

- PowerPoint or PDF
- Maximum **5–6 slides**

9. Evaluation Criteria

The proposals will be evaluated by an international jury according to their technical quality, feasibility, user-centred approach, and potential impact on Pedro's daily life. Projects may be assessed according to the following dimensions:

- **User-centred design (20%)**
Degree to which the solution addresses Pedro's real needs and daily-life challenges, demonstrating empathy and a strong understanding of the user context.
- **Prototype functionality (20%)**
Ability of the prototype to effectively perform its intended function and improve Pedro's autonomy in a practical way.
- **Engineering design (15%)**
Quality of the engineering design, including technical development, CAD modelling, mechanical reasoning, and overall design robustness.
- **Manufacturability (15%)**
Feasibility of manufacturing the solution using PLA and standard FFF/FDM 3D printing, considering assembly and production constraints.
- **Ergonomics and usability (10%)**
Comfort, safety, ease of use, and adaptation of the device to Pedro's physical condition.
- **Scalability / Replicability (10%)**
Potential for the solution to be adapted, reproduced, or implemented for other users with similar disabilities.
- **Pitch quality (10%)**
Clarity, structure, and effectiveness of the final presentation, including communication of the problem, solution, and expected impact.

10. Mentoring and Support

Throughout CAREKATHON, participants will receive continuous guidance and support from an interdisciplinary network of mentors and technical staff. The mentoring framework is designed to help teams transform ideas into feasible, user-centred, and technically robust assistive solutions. Mentoring will be provided by academic staff from the participating universities as well as experts from industry and partner companies, bringing together complementary perspectives from research, education, healthcare, product development, and industrial practice. Mentors from the participating institutions will provide expertise in the following key areas:

- **Engineering Design and CAD Modelling.**
Guidance on concept development, mechanical design, CAD modelling, structural feasibility, and design optimization for manufacturing.
- **Health Sciences and Clinical Insight.**
Support in understanding Pedro's functional limitations, biomechanics, ergonomics, comfort, and safety requirements from a healthcare perspective.
- **Additive Manufacturing and Prototyping.**
Technical assistance related to FFF/FDM 3D printing, including design for additive manufacturing, assembly and prototyping strategies.
- **User-Centred Design.**

Mentoring focused on translating real user needs into practical and meaningful assistive solutions that maximize autonomy and usability.

- **Pitch and Communication Support**

Advice on how to effectively present the problem addressed, the design rationale, the prototype, and the expected impact of the proposed solution.

Support will be provided through a combination of informative capsules, workshops, scheduled mentoring sessions, technical consultations, and feedback checkpoints during the hackathon. This mentoring ecosystem is intended not only to improve the quality of the final prototypes, but also to foster learning, interdisciplinary collaboration, and knowledge exchange among participants from Spain, Finland, and Germany.

11. Awards, Recognition and Academic Benefits

At the end of CAREKATHON, each participating university will select **one winning team** and **one second-prize team**, based on the evaluation criteria established by the international jury.

The awarded teams will receive **attractive prizes** in recognition of the quality, feasibility and impact of their proposed solutions. These prizes will acknowledge the teams' effort, creativity, technical development and contribution to improving Pedro's autonomy and wellbeing. Further details regarding the specific prizes will be announced by the organizing committee before the final phase of CAREKATHON.

In addition to the prizes, winning teams, second-prize teams and other outstanding proposals may receive special recognition during the closing ceremony and in the official dissemination materials of the event.

All participants who successfully complete the hackathon will receive **2 ECTS**, subject to compliance with the attendance and participation requirements established by their home institution. These credits recognize the educational value of the hackathon as an intensive interdisciplinary learning experience involving problem-solving, teamwork, design, and prototyping.

All participants will also receive a **certificate of participation**, recognizing their involvement in an international multidisciplinary innovation challenge.

Special recognition or honorary mentions may be awarded by the jury for outstanding achievements in specific areas such as technical excellence, social impact or user-centred design.

CAREKATHON will also acknowledge the **contribution of collaborators, mentors, industry partners and supporting institutions**, whose expertise and commitment are essential to the success of the event. Their support will be formally recognized during the closing ceremony and in the official dissemination materials of the hackathon.

12. Venue and key dates

CAREKATHON will be hosted simultaneously at the participating universities, with local activities coordinated at each institution and joint international sessions fostering collaboration among participants from Spain, Finland, and Germany. At Universidad de Málaga, the hackathon will take place at the facilities of the **UMA Employability and Entrepreneurship Service**, located at **The Green Ray**, the innovation and entrepreneurship hub of the university.

The venue provides an ideal environment for collaborative work and rapid prototyping, offering:

- Training spaces for workshops, knowledge capsules, and technical sessions.
- Coworking areas designed for teamwork, ideation, and collaborative problem-solving.
- Meeting rooms for mentoring sessions, technical discussions, and jury deliberations.



To ensure participants can fully focus on the challenge, breakfast, lunch, and dinner will be provided to all teams during the hackathon sessions.

Key Dates

- **Registration period**
To be announced
- **Team allocation and challenge briefing**
To be announced
- **Kick-off Session — October 29, 2026**
 - Official opening of CAREKATHON.
 - Presentation of Pedro's case and challenge areas.
 - Knowledge capsules and mentoring introduction.
 - Team briefing and initial ideation.
- **Development and Prototyping Session — November 5, 2026**
 - Collaborative design and CAD development.
 - Technical mentoring sessions.
 - Prototype manufacturing and testing.
- **Final Presentation and Awards — November 6, 2026**
 - Final pitch presentations.
 - Prototype demonstrations.
 - Jury evaluation.
 - Awards ceremony and closing event.

13. Ethical Considerations and Code of Conduct

CAREKATHON is built around a real user case involving functional disability and assistive technology. For this reason, all participants are expected to uphold the highest standards of ethical responsibility, respect, and professional conduct throughout the event. Participants must recognize that the purpose of the hackathon extends beyond technical

problem-solving: it involves designing solutions intended to improve the autonomy, dignity, and quality of life of a real person.

The following ethical principles and rules of conduct shall apply:

Respect for the User

All teams must approach Pedro's case with empathy, sensitivity, and respect. Proposed solutions should prioritize the user's wellbeing, autonomy, comfort, and dignity at all times.

Confidentiality and Responsible Use of Information

Any personal, clinical, or functional information shared during the hackathon must be treated confidentially and used exclusively for educational and design purposes within the context of CAREKATHON. Participants must not share sensitive information outside the event without explicit authorization.

Safety and Responsible Design

All prototypes and concepts must prioritize user safety. Teams should carefully consider mechanical reliability, ergonomics, pressure distribution, material suitability, and potential risks associated with device use.

Inclusion and Respectful Collaboration

CAREKATHON promotes an inclusive, collaborative, and respectful environment. Participants, mentors, collaborators, and organizers are expected to interact professionally and respectfully, valuing diversity of perspectives, backgrounds, and expertise.

Academic Integrity and Originality

All submitted work must be original and developed specifically for the hackathon. Participants are encouraged to build upon existing knowledge and open-source resources when appropriately referenced, but plagiarism or misrepresentation of authorship is strictly prohibited.

By participating in CAREKATHON, all attendees agree to comply with these ethical principles and contribute to a safe, respectful, and socially responsible innovation environment.

14. Partners and Sponsors

CAREKATHON is supported by a multidisciplinary ecosystem of academic, industrial, healthcare, and institutional stakeholders whose collaboration is essential to the success of the initiative.

The hackathon is developed within the framework of the UNINOVIS alliance, bringing together international partners committed to innovation, education, and social impact through interdisciplinary collaboration.

Academic Partners

The core academic partners of CAREKATHON are the participating universities, which provide expertise, infrastructure, mentoring, and coordination for the event:

- Universidad de Málaga (Spain)
- Tampere University (Finland)
- Technische Hochschule Würzburg-Schweinfurt (Germany)

At the University of Málaga, CAREKATHON is jointly coordinated by the Escuela de Ingenierías Industriales and the Facultad de Ciencias de la Salud, combining expertise in engineering, healthcare, and innovation.

Industry Partners

Industry partners and collaborating companies contribute practical knowledge, technical mentoring, and real-world perspectives in product development, manufacturing, and assistive technologies. Their involvement helps bridge the gap between academic learning and industrial application.

These stakeholders may support the hackathon through:

- Technical mentoring.
- Knowledge capsules and workshops.
- Prototyping support and manufacturing expertise.
- Sponsorship and resource provision.
- Innovation and entrepreneurship guidance.

Healthcare and Social Stakeholders

Healthcare professionals, rehabilitation specialists, and social organizations play a key role in ensuring that proposed solutions remain aligned with real functional needs and user wellbeing. Their contribution helps participants better understand ergonomics, rehabilitation challenges and the human impact of assistive technologies.

Sponsors

- GRUPO LOGSA. Medical Devices.
- Novaindef. Ingeniería, Defensa y Espacio.
- Colegio Oficial de Peritos en Ingenieros Técnicos Industriales de Málaga (COPITIMA).
- Colegio Oficial de Ingenieros Industriales de Andalucía Oriental (COIIAOR).



15. Contact and Registration

Students interested in participating in CAREKATHON must complete the official registration process within the application period announced by the organizing committee.

Registration will be carried out through the official CAREKATHON online form, where applicants will be asked to provide basic personal and academic information, including their degree programme, academic year, institution, and motivation for participating in the hackathon.

Registration Process

To apply, participants must:

1. Complete the online registration form.

<https://forms.cloud.microsoft/e/TeQre4h9cS?origin=lprLink>

2. Submit the required academic information and supporting documentation, if requested

3. Accept the participation rules, ethical guidelines, and intellectual property conditions of CAREKATHON

Applications will be reviewed by the organizing committee in accordance with the selection criteria described in the participation rules.

Important Dates

- **Registration Opening:** 28/09/2026
- **Registration Deadline:** 15/10/2026
- **Participant Selection Notification:** 23/10/2026

Contact Information

For questions regarding registration, eligibility, logistics, or participation, applicants may contact the organizing committee at:

Email: subii.eii@uma.es

Further Information

Additional updates, event announcements, detailed schedules, and supporting materials will be shared through the official communication channels of CAREKATHON and the partner institutions.

Participants are encouraged to regularly check the official communication platforms to stay informed about deadlines, event updates, and practical instructions.