

KUKA



KUKA Innovation Award 2021_Artificial Intelligence Challenge





KUKA Innovation Award 2021 - Call for Participation Artificial Intelligence Challenge

Objectives of the award

As a world-leader in robot-based automation, KUKA has maintained an intense collaboration with academia and R&D partners worldwide on various scientific and technical topics for many years. To take this collaboration to the next level the KUKA Innovation Award has been established in 2014. It comes with a substantial financial prize of €20,000. The competition leading to the award is intended to accelerate the pace of innovation in the field of robot-based automation at large and improve technology transfers from research to industry.

The KUKA Innovation Award 2021 primarily targets the improvement of robots and robotic systems using AI technology, such as machine learning, symbolic knowledge representation and reasoning, environmental and object models, automatic motion, grasp and task planning. The aim is to create robots with a higher degree of autonomy and flexibility that are safe and enjoyable to interact with.

Applications can cover a wide field of markets ranging from manufacturing to agriculture, consumer, inspection and maintenance. By using and enhancing a KUKA robot with AI technology, we wish to revolutionize the way we interact with a robotic system during the whole life cycle, from commissioning to programming, operation and service. We particularly encourage participants to make life easier for our system integrators and end-users and enable them to offer better products, services and processes to their customers.

Applicants for the KUKA Innovation Award are invited to select use cases where robots nowadays face serious challenges in interacting with their real-world environment. Submitted proposals should demonstrate how to reach profitability even with small lot sizes and a huge variety of work pieces, and despite continuously changing environments or challenging human-robot collaboration and interaction tasks. The proposed solution is expected to enable new or improve existing, use cases targeting the manufacturing and other domains as mentioned above.

The system concept should be versatile, i.e. broadly applicable, ideally even outside the targeted and demonstrated domain, and not limited to an engineering approach for solving a specific use case. Participants from academia, research and industry are encouraged to present system concepts that can lead to, or are already on the edge to, commercialization.

Participating in the KUKA Innovation Award

The competition is open to the robotics research community at large (including companies). This includes researchers and developers at a post-graduate level or higher



as well as research teams. Individuals and teams must belong to a legal entity that enters into an agreement with KUKA.

The first step in participating in the KUKA Innovation Award is the creation of a proposal. This proposal should include a motivation for the solution to be developed, details regarding its realization and ideally an already established proof of concept in a working system. Transferring experiments and results from legacy components to the hardware provided by KUKA is particularly encouraged. A realistic implementation plan and a description of the team's experience should also be provided. The proposal for participating and getting access to the sponsored hardware must be submitted electronically by June 21, 2020. The proposals will be reviewed and rated based on the assessment criteria. Please find more details below. The 10 top-ranked teams will be invited to pitch their proposals to an international team of judges in an online interview on July 09, 2020. After that, the top 5 teams will be chosen as finalists for the KUKA Innovation Award. KUKA will announce the selected finalists by July 13, 2020.

KUKA offers the 5 finalist teams a freely selectable KUKA robot, depending on availability and suitability for the selected use case, optionally enhanced with a Roboception 3D vision system and all additional products available in the Roboception web shop for the duration of the competition. While using the KUKA robot is mandatory for the finalists, using the provided vision system is optional. Proposed applications may include additional hardware, such as sensors or other mechatronic components to be developed and provided by the applicants. Newly introduced components should provide a clear vision how they can easily blend in with the hardware provided by KUKA.

Each finalist team will sign an agreement with KUKA to implement its ideas on the provided hardware. The teams will be invited to Augsburg to receive an initial training on the hardware and will be continuously technically supported and coached by KUKA experts to be more effective in the implementation phase.

Finally, the teams will be invited to a fair in April 2021 to present their applications and compete for the award in the final round. This will offer the participants the unique chance to present their work to the expert public, the judges and to KUKA management and senior developers and to generate valuable contacts for further studies or technology transfers.

The KUKA Innovation Award judges will determine the winner at the fair based on the assessment criteria listed below with a particular focus on quality and robustness of the presented solutions. Presenting the solution on the fair is a mandatory activity for competing in the Innovation Award. The winner of the KUKA Innovation Award and the €20,000 financial prize will be selected and announced on the fair ground during the award ceremony on the fair.

All intellectual property generated in the competition belongs to the participants. The participants are encouraged to use the KUKA-sponsored exhibition at the fair to engage also with third parties to initiate technology transfers and new cooperation projects.



Outline and content of the proposals

The proposal should be aligned along the following structure:

1. Cover page
 - a. Project full title and short title/acronym
 - b. Applicant contact data (name and institution of project leader)
 - c. Summary of project proposal
2. Team description
 - a. Institution/ laboratory/ group description
 - b. Background in robot-based automation (especially experience with robots, projects, knowledge and track record the project capitalizes on)
3. Motivation and objectives
 - a. Description of the intended use-case, challenges and relevance to potential markets
 - b. Objectives of the proposed work with an outline of the advances focusing on the challenge
4. Approach and realization
 - a. Technical details of the proposed solution including a description why the proposed solution is promising as well as a pictures and videos of the current stage of development (ideally, an already established proof of concept in a working system).
 - b. Work plan for the duration of the competition (from the announcement of the finalists until the fair in April 2021). Please list suitable milestones and expected use of resources.
 - c. Initial concept for the system design and a list of to be used hardware and software (libraries, licenses), in particular which KUKA robot or product family (e.g. reach and payload) is most suitable for the intended use case.
5. Targeted results and measures of success
 - a. Results regarding the topic of the award
 - b. Assessment of technology readiness level of the proposed solution including its scalability, the reusability of used and developed components and risk assessment
 - c. Outline of possible integration/ cooperation with KUKA regarding the proposed systems/ methods
6. Analysis of economic impact and competitive advantages
 - a. Economic impact on potential markets
 - b. Summary of transferable/ licensable technology and time-to-market estimation
 - c. Competitive advantage with respect to existing solutions (research/ technology / applications)



Award applications must be written in English and are limited to 12 pages addressing the items above in a balanced manner. Teams are encouraged to provide links for video material or pictures in the 12 pages.

Assessment criteria for the KUKA Innovation Award

The main assessment criteria will be the level of innovation¹ paired with the quality, the level of integration and technological readiness² of the proposed solutions. Further criteria for the selection will be the originality of the overall approach, the expected economic impact³ of the suggested application and its competitive advantage⁴. In addition, participants are encouraged to demonstrate scalability and reusability of their components and algorithms to different kinematics, sensors, and tasks.

Already existing components should be reused and not developed from scratch as far as possible. Last but not least, components and algorithms need to be validated and presented in a realistic work environment, not just in simulation or under special conditions. Ideally, end-user requirements must be fulfilled, which includes performing a risk assessment of the developed application and implementing safety functions according to the determined requirements⁵.

¹ The term *innovation* can be defined as something original and more effective and, as a consequence, new, that "breaks into" the market or society. See <http://www.businessdictionary.com/definition/innovation.html>

² *Technological readiness* measures the technological maturity and robustness of an evolving technology on a scale from 1 to 9. See https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf

³ *Economic impact* measures the economic effect (growth) caused by proposed system or solution in a certain area. See <https://www.ebp-us.com/pdf/cued99-econ-impact.pdf>

⁴ *Competitive advantage* measures the uniqueness of a solution in economic terms compared to the approaches taken by competitors. See <https://www.thebalance.com/what-is-competitive-advantage-3-strategies-that-work-3305828>

⁵ A *guidance and explanation* of relevant rules and standards regarding safety in human-robot collaboration is provided by a VDMA Position Paper, see https://robotik.vdma.org/documents/105999/16922915/1493970057035_VDMA_Position%20Paper_MRK_Safety_EN.pdf/edfe5e2d-9686-433b-93b6-30e835471546



KUKA Innovation Award judges

Prof. Dr. Oussama Khatib (Director of Robotics Lab, Stanford University)

Prof. Dr. Alin Albu-Schäffer (Director of Robotics and Mechatronics Institute, DLR)

Prof. Dr. Ir. Stefano Stramigioli (Director of the Robotics and Mechatronics Lab, University of Twente)

Prof. Dr. Tobias Ortmaier (Director of Institute of Mechatronic Systems, Leibniz University Hannover)

Erico Guizzo (Senior Editor, IEEE Spectrum Magazine)

Dr. Rainer Bischoff (Vice President Corporate Research, KUKA)

Schedule

June 21, 2020	Application deadline
July 09, 2020	Pitches of top 10 applications
July 13, 2020	Announcement of finalists
April, 2021	Setup of applications at the fair with final presentation

Contact and further information

For further questions and to submit the application: innovationaward@kuka.com

Find out more about the KUKA Innovation Award: www.kuka.com/InnovationAward2021



Terms and Conditions

Eligibility

You are eligible to enter the competition if you meet the following requirements at time of entry:

- You are affiliated to a legal entity (company, university or research institute etc.), which is signing an agreement with KUKA that is handling the lending of the provided hardware and all financial issues regarding your participation.
- You are not an employee or intern of KUKA AG or their affiliated companies.
- You are not involved in any part of the execution or administration of this competition.
- You are not an immediate family member (parent, sibling, spouse, and child) or household member of a KUKA employee or an employee of KUKA affiliated companies, or a person involved in any part of the administration and execution of this competition.

Confidentiality

KUKA, the judges and the experts assigned will treat the submitted project material confidential. Intellectual Property (IP) generated in the competition belongs to the participants. If KUKA and a participant are interested in a technology transfer or access to IP, a separate agreement between the participant concerned and KUKA will be established.

Innovation

To accelerate the pace of innovation in the field of robot-based automation and to improve technology transfers from research to industry for the finalist teams, KUKA will organize a special confidential session at the fair to bring together finalists with KUKA top management and senior developers. This is to offer finalist teams the opportunity to present technical details of their solution and to suggest to KUKA on how to possibly exploit their developments in further bilateral research and development cooperation.

Lending agreement

Granting of access to a KUKA robot and the suggested vision sensor shall be conditional upon signing a lending agreement. Such lending agreement may not be signed by private individuals, but only by an authorized representative of a legal entity (company, university or research institute etc.). By signing the lending agreement, the lender agrees to do its utmost to fulfil the work plan described in the Award proposal. The costs for fulfilling the work plan as described in the proposal including personnel and additionally required hardware and software must be borne by the finalists.



Prize

No transfer, substitution or cash equivalent for travel and accommodation grants, sponsored access to hardware and prizes is allowed, except at KUKA' sole discretion. The prize money can only be transferred to legal entities; transfers to individual persons cannot be made. KUKA reserves the right to substitute a prize, in whole or in part, of equal or greater monetary value if a prize cannot be awarded, in whole or in part, as described for any reason.

Copyright

Applications shall only include material that you own or where permission has been granted by the copyright/trademark owner. Applications and robot programs may not include copyrighted materials (such as source code, user interface, background music, images or video) unless you own or have permission to use the materials. The team must provide a list of non-proprietary tools, libraries and source codes used.

Reimbursement of travelling and exhibition expenses

Applicants bear their own costs with the exception of costs explicitly listed here. KUKA will cover all costs related to lending, servicing, and supporting the KUKA robot in the context of the KUKA Innovation Award.

KUKA offers a travel and accommodation grant to reduce the financial burden of finalist teams in the context of the demonstrations at the fair covering the following items:

- Accommodation at the fair for up to three members per finalist team (arranged by KUKA),
- incurred travel expenses up to 1200 € for German teams, 1900 € for European teams and up to 3300 € for non-European teams,
- transportation costs for equipment (arranged by KUKA).

This grant can be accessed by the finalist teams' legal entity via handing in a cost claim with all necessary receipts of the costs incurred by three members per finalist team after the fair.

On accepting the invitation for participating in the Award finals at the fair, the teams agree to set up and present their solutions to the expert public, the judges, KUKA top management and senior developers. The costs for presentations at the fair relating to exhibition space, designing a representative booth and supporting the setup and dismantling of booths and equipment will be borne by KUKA.

KUKA reserves the right to reclaim any surplus payment or money paid in error. Furthermore, KUKA may cancel the accommodation and travel grant and demand payment repayment, if the financial support was obtained under false pretenses, if not used for the intended purpose, if any obligation regarding the final is not fulfilled, or for any other sound reason.



KUKA does not provide any kind of insurance. Finalists shall insure themselves and their own equipment against any possible costs and consequences caused by loss, theft, illness, accident, personal liability, etc.

FAQ

Where can I get more information on the provided hardware?

- [Industrial robots from KUKA](#)
- [Roboception vision sensor](#)

Who can participate?

Teams and individuals from legal entities (companies, universities or research institutes etc.) may participate. Proposals can only be made in the name of the legal entity. Lending agreements and financial issues can only be handled with the participant's legal entity.

Why should I participate?

The competition leading to the KUKA Innovation Award may allow you

- to access KUKA's latest robot hardware free of charge,
- to receive a KUKA training and advanced coaching for the duration of the award,
- to present your solutions to the expert public at one of the world's most important industrial trade shows,
- to present your solutions to KUKA top management and senior developers,
- to engage in a closer collaboration and technology transfer of your innovative technology to one of the world leaders in robot-based automation (subject to a separate license agreement),
- to travel a major fair for presenting your work at KUKA's expense,
- to use this opportunity to meet and engage with other parties interested in your work,
- to win €20,000!

What are the evaluation criteria for obtaining a sponsored hardware?

The main criteria for evaluation are outlined above. Furthermore, please address the following aspects in your proposal:

- Scalability and reusability of components and algorithms,
- validation of proposed solution in a realistic work environment,



- risk assessment of the developed application and implemented safety functions according to the determined requirements.

Data privacy

To process applications and to provide continuous support, KUKA collects and electronically stores the data submitted by applicants. These data include personal information (name, address, date of birth, nationality, phone numbers and e-mail addresses and organization of the applicants) as well as information on the project and the support granted.

KUKA may publish the names of the participating teams, their project titles, project videos and project abstracts on KUKA websites, via social media, in press releases and in printed publications.