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Japan Science and Technology Agency (JST)

JST to jointly fund three research projects with NRF of Korea on the theme of AI in the Physical World under the SICORP framework

The Japan Science and Technology Agency (JST) has approved funding for three new collaborative international research projects jointly with the National Research Foundation of Korea (NRF)*¹ in the research field of “AI in the Physical World” under the Strategic International Collaborative Research Program (SICORP)*² (Attachment 1).

JST received a total of 13 proposals for this call. Three were selected after evaluation by a panel of experts (Attachment 3). The research period is scheduled to be three years (36 months).

*1 About the National Research Foundation of Korea (NRF)

<https://eng.nrf.re.kr/>

*2 About the Strategic International Collaborative Research Program (SICORP)

Based on interministerial agreements on science and technology cooperation, JST has been executing the international joint research program called SICORP since FY2009, together with leading countries and regions and in research fields that have been strategically prioritized by MEXT. The aim of this program is to contribute solutions to challenges facing world today and to bolster Japan's scientific and technological capabilities through collaboration with a broad range of countries.

<https://www.jst.go.jp/inter/english/index.html>

Attachments

Attachment 1. Outline of Funded Projects

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Attachment 3. Experts for the Evaluation (JST side)

Inquiries

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“Empowering Science, Inspiring Futures”

Our world faces unprecedented global challenges — such as climate change, energy crises, and emerging infectious diseases — that demand innovative solutions. JST will rise to these challenges through “Science and Technology,” as a national research and development agency that plays a central role in implementing Japan’s science, technology, and innovation policy. We support fundamental research and startups to create new value, develop R&D strategies, foster the next generation of talent, disseminate vital information, and manage the Japan University Fund. Like a compass guiding ships through turbulent waters, JST will chart the way towards a vibrant and secure future by empowering science through a multifaceted approach.

Outline of Funded Projects

Project Title (Abbreviation)		Principal Investigators	Project Outline
1	Towards Reasoning-Enabled Surgical Robots: Integrating Digital Twins and Real-World Robotics for Cognitive Development (RESR-CD)	ARATA Jumpei Professor, Department of Mechanical Engineering, Kyushu University (Japan)	Current surgical robots, while capable of highly precise and repetitive motions through the use of machine learning, still lack the advanced reasoning and real-time cognitive abilities required to cope with the constantly changing environment of actual surgical procedures, leaving significant challenges for clinical implementation. This project aims to greatly enhance the cognitive reasoning and adaptability of surgical robots for laparoscopic surgery. Because the operating context integrates real-time recognition of endoscopic images with anatomical annotation, and can be framed as a natural-language-conditioned task, the Vision-Language-Action (VLA) model is considered well suited and has the potential to advance autonomous robotic actions. Accordingly, the Japanese team will provide the foundational research platform—consisting of a real-world system and a high-fidelity digital twin of the surgical environment—while the Korean team will leverage its extensive expertise in medical-image AI to build the initial framework for VLA implementation. Using training data generated within the digital twin, the two institutions will jointly apply the VLA model to the surgical robot system. Their collaboration is expected to accelerate the medical application of VLA models and make a major contribution to the advancement of next-generation surgical robotics.
		Deukhee LEE Principal Researcher, Bionics Research Center, Korea Institute of Science and Technology (Korea)	

Project Title (Abbreviation)		Principal Investigators	Project Outline
2	Integrated Virtual-Physical AI for Ultra-Precision Manufacturing of Advanced Semiconductor Devices (AISemicon)	HAMAGUCHI Satoshi Specially Appointed Professor, R ³ Institute of Newly-Emerging Science Design, The University of Osaka (Japan)	This project seeks to deliver groundbreaking advancements in the efficiency and precision of mass production technologies for semiconductor chips, with particular emphasis on the cryogenic plasma etching process—one of the most critical stages in semiconductor fabrication. Specifically, the objective is to develop an integrated, AI-enhanced framework for improved understanding and control of semiconductor manufacturing processes. The project is structured into three interrelated work packages. Work Package 1 is dedicated to the development of machine-learning force fields (MLFF) for the analysis of surface reactions of silicon oxide and silicon nitride when exposed to chemically reactive plasmas, using molecular dynamics (MD) simulations. The force fields developed in this effort will be capable of handling non-equilibrium atomic configurations for which conventional density functional theory (DFT) calculations fail to converge. To achieve this, hybrid models combining robust classical force field (FF) methods with MLFF will be constructed. Work Package 2 focuses on the creation of AI-based process monitoring systems that incorporate predictive models. These models will be trained using both experimental sensor data from processing tools and simulation data, including the outputs generated in Work Package 1. Work Package 3 aims to integrate the predictive models with a large language model (LLM) within a digital twin platform. This integration will enable automated feedback control, facilitating real-time optimization of plasma etching processes through the coupling of AI-driven decision-making with experimental validation. The anticipated outcomes of this project include significant enhancements in manufacturing accuracy, reliability, and cost-efficiency.
		Byungjo KIM Assistant Professor, Department of Materials Science and Engineering, Ulsan National Institute of Science and Technology (Korea)	

Project Title (Abbreviation)		Principal Investigators	Project Outline
3	Robot Learning for Safe Human-Robot Collaboration: A Unified Framework Combining Constrained Reinforcement Learning and Formal Verification (SafeRL-HRC)	MATSUBARA Takamitsu Professor, Graduate School of Science and Technology, Nara Institute of Science and Technology (Japan)	This project introduces a unified robot learning framework for safe and efficient human-robot collaboration (HRC). The framework integrates constrained reinforcement learning (CRL), probabilistic motion primitives (ProMPs), and formal verification techniques to enable robots to operate adaptively in dynamic, human-centered environments. Key research areas include safe skill acquisition through CRL with safety constraints, learning motion primitives from human demonstrations using probabilistic models, and achieving real-time runtime safety guarantees via control barrier functions (CBFs) and formal verification. The proposed technological innovation lies in the novel combination of CRL, ProMPs, and CBFs into a unified architecture, along with the first-time integration of formal verification tools with learned policies for HRC tasks. The project will develop new contact-aware and contact-implicit trajectory optimization methods and implement real-time safety filters on physical robot platforms, leveraging hardware acceleration. The Korean team, with strengths in theoretical research, will be responsible for designing reinforcement learning and safety filters. In contrast, the Japanese team, with strengths in implementation and experimentation, will lead the development of algorithms. Nevertheless, researchers from both countries will collaborate closely on all elements. The outcomes will be validated through hardware-in-the-loop and real-world collaborative robotic systems, targeting future industrial and assistive applications. The project aims for quantifiable objectives, including a policy violation rate of below 5% for CRL, a collision rate of 0 in physical trials for CBF safety filters, and a task completion rate of at least 90% in human-in-the-loop HRC scenarios.
		Kwangki KIM Associate Professor, Department of Electrical and Electronic Engineering, Inha University (Korea)	

Overview of Call for Proposals

1. Partner Funding Agency

National Research Foundation of Korea (NRF)

<https://eng.nrf.re.kr/>

2. Research Field

AI in the Physical World

3. Eligibility (Japan)

Applicants must be researchers engaged in research at universities, research institutions, or companies located in Japan

4. Project Duration

3 years (36 months)

5. Research Budget (JST-side)

The Japanese side of the team will receive a maximum of 30 million yen (including indirect expenses equivalent to 30% of direct expenses)

6. Evaluation Method

Proposals will be evaluated by experts from the two countries and discussion between JST and NRF.

7. Evaluation Criteria

i) Researcher capacity

Track record and expertise of the researchers

Appropriateness of research team organization

ii) Excellence

Excellence and originality of the project's objectives

Appropriateness of the methodology and feasibility

iii) International cooperation

Necessity and concreteness of international cooperation

Complementarity of the research partners

iv) Expected impacts

Dissemination and exploitation of research results

Academic, economic, and social impacts

Experts for the Evaluation (JST side)

Name	Title and Affiliation	Role
MASE Kenji	Emeritus Professor, Nagoya University Designated Professor, Center for Artificial Intelligence, Mathematical and Data Science, Nagoya University	Program Officer
KAWAMOTO Masayuki	President, i Mobility Platform Inc.	Advisor
KURATA Takeshi	Director, Research Institute on Human and Societal Augmentation, National Institute of Advanced Industrial Science and Technology	Advisor
SUGAYA Midori	Professor, Department of Computer Science and Engineering, College of Engineering, Shibaura Institute of Technology	Advisor
TAKAHASHI Masaki	Professor, Department of System Design Engineering, Keio University	Advisor
TAKEDA Kazuya	Professor, Institutes of Innovation for Future Society Global Research Institute for Mobility in Society, Special Presidential Adviser, Nagoya University	Advisor
TAKEDA Koichi	Project researcher (Project professor), Research and Development Center for Large Language Models, National Institute of Informatics	Advisor
DOMAE Yukiyasu	Team leader, Embodied AI Research Team, Artificial Intelligence Research Center, National Institute of Advanced Industrial Science and Technology	Advisor
NAYA Futoshi	Vice President, Head of NTT Communication Science Laboratories, NTT Corporation	Advisor
MATSUBARA Takashi	Professor, Faculty of Information Science and Technology, Hokkaido University	Advisor
MORIMOTO Jun	Professor, Graduate School of Informatics, Kyoto University	Advisor
YAMATO Junji	Professor, Faculty of Informatics Department of Information Science, Kogakuin University	Advisor
YONETANI Ryo	Senior Research Scientist, AI Lab, AI tech studio, CyberAgent, Inc.	Advisor

* Advisors are listed in Japanese syllabary order.

** Title and Affiliation is as of the time of end of evaluation