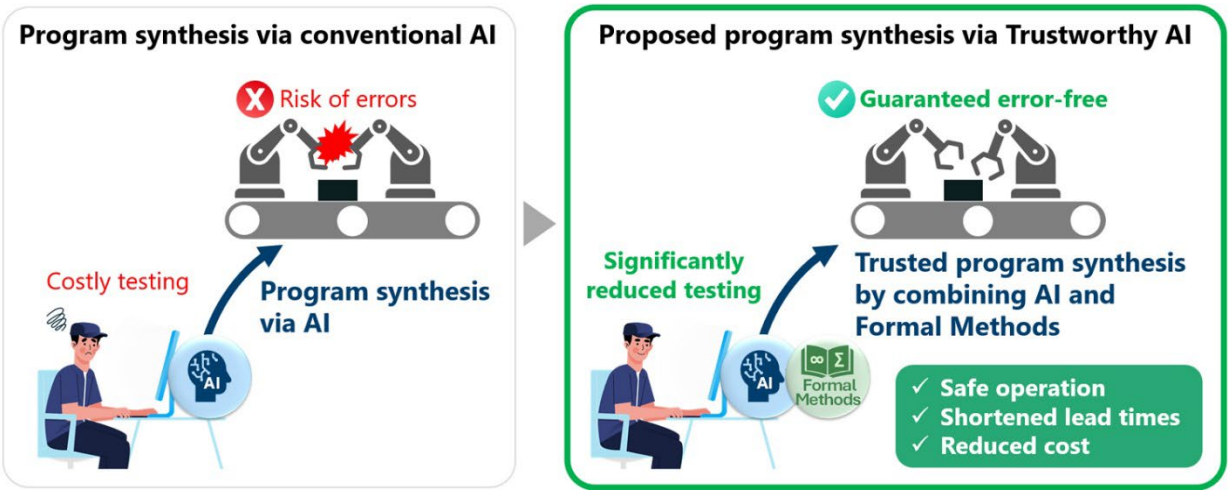
September 18, 2025

Mitsubishi Electric Corporation

National Institute for Research in Digital Science and Technology

Mitsubishi Electric and Inria Commence Joint Technology Development to Ensure AI Trustworthiness Using Formal Methods

Will deliver next-generation AI technology and help to realize a society where AI can be used with peace of mind



Comparison between conventional AI and trustworthy AI

Mitsubishi Electric Corporation and Inria, France's National Institute for Research in Digital Science and Technology (Institut national de recherche en sciences et technologies du numérique), announced today that they have launched a joint research project titled "Formal Reasoning applied to AI for Methodological Engineering" (FRAIME) with the aim of realizing trustworthy AI systems. This project will be one part of Inria's DÉFI,* a large-scale industry-academia collaboration program, to achieve trustworthy AI systems and establish next-generation AI technology by integrating Formal Methods** technologies, a mathematical approach, with AI technologies.

With the rapid development and global spread of AI, companies that develop and provide AI systems are required to manage risks appropriately. In particular, systems that require a high level of safety, such as infrastructure systems and cybersecurity systems, can cause significant damage in the event of any malfunction, making it extremely important to guarantee the reliability of AI output. In theory, AI reliability assessment requires exhaustive testing, thoroughly verifying output results for all possible inputs. However, it is a challenging task that takes an enormous amount of time and incurs huge cost.

---

* French word meaning "challenge."

** Mathematical methods that strictly describe the specifications of programs and information systems using mathematical formulas and logical expressions, enabling comprehensive verification. By confirming logical correctness without relying on exhaustive testing, it is possible to prevent bugs and design errors in advance, thereby ensuring safety and validity.

Mitsubishi Electric's European subsidiary, Mitsubishi Electric R&D Centre Europe, and Inria have been collaborating through joint research on advanced verification technologies utilizing Formal Methods since 2015. This cutting-edge initiative is aimed at developing a technology that theoretically verifies the reliability of AI output by combining Formal Methods technologies with AI technologies such as large-scale language models, leveraging the expertise of both parties and building on their long-standing track record and trust-based relationship. The goal is to further expand the scope of AI application towards systems that require high levels of trustworthiness.

Through this project, Mitsubishi Electric R&D Centre Europe and Inria will leverage their joint strengths to establish next-generation AI technology that combines reliability and practicality, helping to realize a society where AI can be used with peace of mind.

Outline of Joint Research Project

Project name	FRAIME	
Objectives	Realization of trustworthy AI systems through the combination of Formal Methods technologies and AI technologies ・Establishment of technology capable of theoretically verifying AI-generated contents using Formal Methods ・Construction of reliable AI processes*** that integrate Formal Methods and machine learning ・Realization of efficient work processes through interaction among users, AI, and Formal Methods	
Roles	Mitsubishi Electric R&D Centre Europe	Providing domain knowledge from a social implementation perspective, and developing technologies based on industrial application experience
	Inria	Providing cutting-edge academic knowledge of Formal Methods and AI, and developing technologies that pursue novelty and originality
Term	September 2025 to August 2029	

Detailed Objectives

1) ***Establishment of technology capable of theoretically verifying AI-generated contents using Formal Methods***
   - Establish technology using Formal Methods, a mathematical approach, to theoretically verify the accuracy of specifications and programs generated by generative AI.
   - Enable reliable program generation and maintenance, greatly improving the practical application of AI in industrial fields such as during the safe operation of equipment and stabilization of operations.

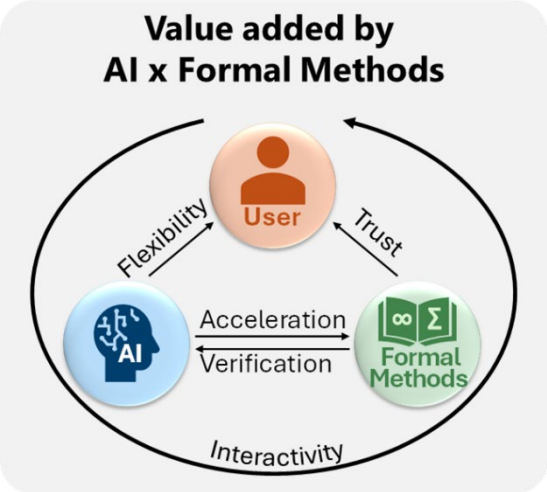
*** The series of internal calculations and output generation performed by a machine learning model to make inferences and judgments based on input data.

2) Construction of reliable AI processes that integrate Formal Methods and machine learning

- Realize flexible and reliable AI processes by leveraging the features of Formal Methods, a combinatorial approach used for software engineering, and machine learning, a statistical approach.
- Intended for application in a wide range of fields, including industry, in robot control systems and other areas that require complex judgment and control.

3) Realization of efficient work processes through interaction among users, AI, and Formal Methods

- Enable users to freely and quickly adjust AI output with minimal effort by establishing a continuous feedback loop among users, AI, and Formal Methods.
- Significantly reduce rework through automatic and continuous verification mechanisms, achieving shorter lead times and lower costs while maintaining high reliability during actual operation.



FRAIME joint research project development objectives

Future Plans

Mitsubishi Electric and Inria will work to establish next-generation AI technology that combines Formal Methods technologies and AI technologies to ensure trustworthiness and practicality, and conduct PoCs (proofs of concept) to verify its effectiveness. In addition, they will aim to spur medium- to long-term innovation through the following contributions:

・Publication of open source prototypes
・Publication of academic papers
・Expansion into new application fields

Furthermore, with the aim of realizing a safe and secure society, they will identify future challenges and conduct research and development of technologies to address these. They will also strengthen partnership between industry and academia in order to foster the next generation of joint collaborative efforts. In addition, through this project, Mitsubishi Electric and Inria will nurture young researchers, such as PhD students, to help continuously improve research and development capabilities, the resolution of social issues, and the creation of new value.

###

About Mitsubishi Electric Corporation

With more than 100 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. Mitsubishi Electric enriches society with technology in the spirit of its "Changes for the Better." The company recorded a revenue of 5,521.7 billion yen (U.S.$ 36.8 billion*) in the fiscal year ended March 31, 2025. For more information, please visit www.MitsubishiElectric.com

*U.S. dollar amounts are translated from yen at the rate of ¥150=U.S.$1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2025

About Inria

Inria is France's national institute for research in digital science and technology, and since January 2024 has been responsible for the Agence de programmes dans le numérique (Digital Programs Agency), which aims to strengthen the collective dynamics of higher education and research. Its DNA is based on world-class research, technological innovation and entrepreneurial risk. Within 220 project teams, most of which are shared with major research universities, more than 3,800 scientists are exploring new avenues, often in interdisciplinary collaboration with industrial partners, to meet ambitious challenges. As a technology institute, Inria supports a wide range of innovation paths: from open source software publishing to the creation of technology startups (Deeptech). Inria has been awarded the Institut Carnot label, confirming its commitment to forging closer links between research and industry. For more information, please visit www.inria.fr

Media Inquiries

Mitsubishi Electric Corporation
Public Relations Department
prd.gnews@nk.MitsubishiElectric.co.jp

National Institute for Research in Digital Science and Technology
nathalie.lacaux@inria.fr

Customer Inquiries

Mitsubishi Electric R&D Centre Europe
1 Allée de Beaulieu, 35700 Rennes, France
info@fr.merce.mee.com

National Institute for Research in Digital Science and Technology
nathalie.lacaux@inria.fr