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Mitsubishi Electric Develops Edge-device Language Model for Domain-specific Manufacturing

Leverages data augmentation to optimize language-model responses for user applications



Language model for manufacturing industry operating on edge devices

TOKYO, June 18, 2025 – <u>Mitsubishi Electric Corporation</u> (TOKYO: 6503) announced today that it has developed a language model tailored for manufacturing processes operating on edge devices. The Maisart^{®1}-branded AI technology has been pre-trained with data from Mitsubishi Electric's internal operations, enabling it to support a wide range of applications in specific manufacturing domains. In addition, the model leverages a uniquely developed data-augmentation technique to generate responses optimized for user-specific applications.

The widespread adoption of generative AI is accelerating the use of large language models (LLMs). However, the significant computational and energy costs associated with LLMs are a growing concern. Additionally, there is increasing demand for generative AI solutions that can operate in on-premises² environments due to data privacy and confidential information management requirements.



Mitsubishi Electric's AI technology brand aimed at making every device smarter.

¹ "<u>M</u>itsubishi Electric's <u>AI</u> creates the <u>State-of-the-ART</u> in technology":

² A model in which a company or organization builds, manages, and operates its IT infrastructure (servers, network equipment, etc.) within its own facilities, as opposed to cloud-based models that operate over the internet.

In response, Mitsubishi Electric has developed a domain-specific language model by training a publicly available Japanese base model with the company's proprietary data from its own business domains, including factory automation (FA). Using training data generated through the company's original augmentation techniques enabled effective, task-specific fine-tuning. The resulting model is compact enough to run on limited hardware resources, making it suitable for environments with constrained computing capabilities such as edge devices, as well as for on-premises operations such as call centers that handle sensitive customer information.

The language model was developed as part of the AWS Japan Generative AI Accelerator Program³ provided by Amazon Web Services Japan G.K. AWS Japan provided support for the development, including computing resources such as GPUs⁴ and AWS Trainium⁵ for language-model training, assistance in building distributed training environments, AWS credits, and scientific support from the AWS Generative AI Innovation Center.⁶

Features

1) Language model for edge devices to support AI adoption in specific manufacturing domains

- Based on an open-source model published by the LLM-jp,⁷ in which Mitsubishi Electric participates, the company developed a language model that can be specialized for specific manufacturing domains. The language model can be trained with proprietary data, such as product manuals and call center interaction logs, all of which are legally and ethically sound.
- By applying model compression techniques,⁸ the language model was made small and efficient enough to run on edge devices that previously lacked sufficient memory. Low-latency and privacy-conscious processing contribute to cost reductions in generative AI operations across various fields, such as smart factories, edge robotics, and energy control.

2) Proprietary data-augmentation technology enables effective, task-specific training and optimized response generation for user applications

- Task-specific training data pairs user inputs (e.g., inquiries or text generation prompts) with desirable responses. The system then extracts alternative responses that are textually similar but incorrect for the given input, treating them as undesirable responses. Mitsubishi Electric's patented data-augmentation technique automatically generates desirable/undesirable response pairs, thereby enriching the training data and helping the model produce more appropriate outputs.
- Additional fine-tuning using task-specific data owned by individual manufacturers is also supported, allowing for the construction of language models optimized for each user's specific applications and precise adaptation to specific domains and tasks.
- In tests evaluating the accuracy of knowledge related to Mitsubishi Electric's FA products, domain- and task-specific training achieved an accuracy rate exceeding 75%.

⁶ https://aws.amazon.com/ai/generative-ai/innovation-center/

³ This is a Japan-specific support program that was developed by AWS in 2023, building on a large-scale language model (LLM) focused development support program, and launched in July 2024.

⁴ Graphics processing unit for image processing and parallel computation at high speed to significantly reduce LLM training time.

⁵ AWS-developed custom chip specifically for cost-efficient, high-performance training of AI models.

⁷ Japan-based organization where private and academic researchers share information on the research and development of LLMs, with all source code and training data related to model development made publicly available. Operated by the Research and Development Center for Large Language Models at the National Institute of Informatics (NII).

⁸ A method for compressing model size without compromising accuracy, such as quantization for encoding model parameters with lower bit precision.



Evaluation results in FA domain and Q&A tasks

Future Development

Mitsubishi Electric is now exploring opportunities to run language models on devices such as industrial equipment and robots. The company will also conduct real-world validation both internally and externally, aiming to put the language model into practical use by the fiscal year beginning in April 2026.

Maisart is a registered trademark of Mitsubishi Electric Corporation. MELSOFT is a registered trademark of Mitsubishi Electric Corporation. GPT-4 is a registered trademark of OpenAI OpCo, LLC.

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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 <u>www.MitsubishiElectric.com</u>

*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