Remarks for Special Issue on Revolutionizing Business Practices with Generative AI

Large Language Models (LLMs), which underpin generative AI, are garnering significant attention. A key factor behind this surge of interest is OpenAI's ChatGPT (Generative Pre-trained Transformer), which reached a staggering milestone of one million users in just five days, vastly outpacing the adoption rates of Netflix, which took 1,278 days, and Facebook, which took 304 days to achieve the same feat. While generative AI LLMs may seem to have sprung up overnight, experts in natural language processing have been aware of the significant research advances in recent years that made this technology possible. Key research papers in this area include the 2017 Transformer paper[*1] and the 2020 Scaling Law paper,[*2] among others. Their findings, combined with enhancements in the performance of graphics processing units (GPUs) that facilitated the management of larger models, swiftly propelled LLMs to a commercially viable level.

To effectively incorporate generative AI into business, it is critical to thoroughly understand the technical challenges, such as hallucinations,[*3] biases inherent in training data, and issues surrounding personal and copyrighted information, while ensuring its safe use without compromising the potential that LLMs possess. One of the potentials of LLMs is that they can respond to any question or discussion at a level equivalent to humans. Moreover, the knowledge and data they possess far surpasses human capabilities. Since all social, technological, and industrial systems can be explained through language, it is not an exaggeration to say that every system in society could potentially be automated with LLM technology.

NEC has been at the forefront of AI technology research and development for over three decades. Our contributions to the field have been consistently recognized at leading

[*1] A. Vaswani et al.: Attention Is All You Need, 2017, https://arxiv.org/abs/1706.03762
[*2] J. Kaplan et al.: Scaling Laws for Neural Language Models, 2020, https://arxiv.org/abs/2001.08361
[*3] The phenomenon where generative AI generates incorrect information but presents it as if it were a fact.

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international AI conferences. In terms of scholarly output, NEC has been a standout performer, securing a top position in the number of published papers from 2000 to 2022 at prestigious conferences such as NeurIPS, ICML, ECML-PKDD, KDD, and ICDM. NEC is also a global leader in filing international patent applications in the areas of biometric authentication, video recognition, and analysis and prescription AI. This leadership in innovation and intellectual property solidifies our standing in the AI technology sector. In March 2023, NEC marked another significant milestone by initiating one of Japan's largest AI-dedicated supercomputers. This achievement was followed in July by the completion of a Japanese LLM. December of the same year saw the launch of "cotomi," an innovative generative AI platform powered by our proprietary LLM.

NEC plans to pursue new initiatives in generative AI technology (**Fig. 1**) with a focus on several innovative areas, including: (1) Multimodal AI: Integrating diverse data types such as images, voice, and sensor signals with LLMs, (2) Proprietary foundation models: Building customized AI models for different purposes through a new architecture that allows seamless expansion of LLM size and integration with diverse specialized AI, (3) Automation of system construction and operation, (4) Orchestration functions: Decomposing various tasks, autonomously arranging and coordinating AI models, controlling networks and security, and automating a wide range of real-world operations, (5) Safe and secure LLM: Ensuring security that encompasses not only cybersecurity but also ethics, hallucination minimization, and data integrity to provide a safe and secure experience. NEC also presented this new AI-based architecture and some of our Generative AI technologies at NEC Innovation Day in December 2023.[*4] In this special issue, we will broadly introduce the entire range of generative AI technology solutions that NEC is currently working on.

We are at an important point of major technological innovation with generative AI. NEC will work closely with our customers to make every effort to use generative AI technology to help build a better society and contribute to business. We sincerely hope that together, we can embrace the future shaped by advancements in AI technology, united by our shared visions and aspirations.

[*4] NEC Innovation Day 2023,
https://www.nec.com/en/global/ir/events/pr/others.html

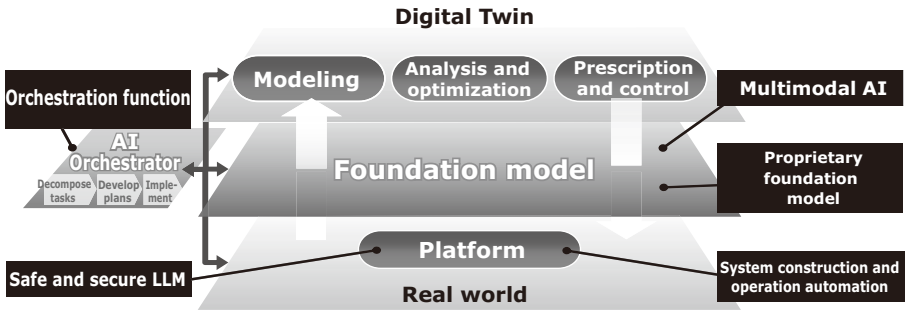

Fig. 1 Digital twins integrated with AI technologies and strategic technological approaches.

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– Advancing the Societal Adoption of AI with the Support of Generative AI Technologies

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Approaches to Generative AI Technology: From Foundational Technologies to Application Development and Guideline Creation

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