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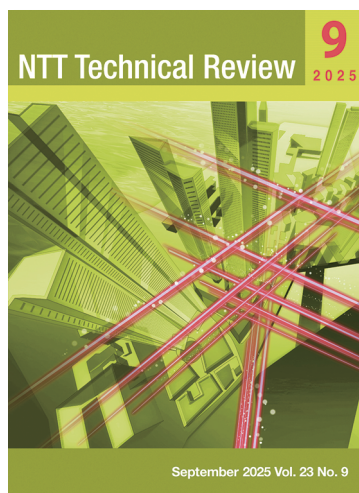## Front-line Researchers

Ryuichiro Higashinaka, Visiting Senior Distinguished Researcher, NTT Human Informatics Laboratories

▼Abstract

Regarding communication between people, when people share "common ground"—such as common topics, prerequisites, and perceptions—they can understand each other and engage in communication. If we could build common ground between computers and people, communication between them would become smoother. Ryuichiro Higashinaka, a visiting senior distinguished researcher at NTT Human Informatics Laboratories, is attempting to elucidate common ground by using generative artificial intelligence and other techniques to enable communication between computers and humans. We spoke with him about his approach to tackling "old-yet-new" problems and his belief that "it wasn't a failure, but rather the effort was simply not successful."

Feature Articles
Keynote Speeches and R&D on Access Networks Presented at Tsukuba Forum 2025

Creating Value That Transforms the World: Access Networks to Support a Sustainable Society

▼Abstract

NTT Access Network Service Systems Laboratories (AS Lab) conducts research and development on access networks across five key domains: optical-fiber access technology, infrastructure technology, access system technology, wireless access technology, and operation technology. With the aim of achieving new value creation and contributing to global sustainability, AS Lab is promoting research to accelerate the implementation of IOWN (the Innovative Optical and Wireless Network) and 6G (sixth-generation mobile communication systems). This includes efforts to support service diversification, smart operations, and the development of new business domains. This article introduces AS Lab's latest technologies in these areas.
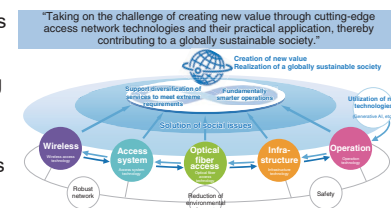
Regular Articles

Compositional Abilities Emerge Multiplicatively: Exploring Diffusion Models on a Synthetic Task

▼Abstract

Modern generative models exhibit remarkable abilities to produce realistic data. However, for practical use, they must reliably compose new combinations of concepts to generate outputs unseen during training, reflecting real-world compositionality. Prior research shows that diffusion models exhibit intriguing yet inconsistent compositional generalization abilities in text-to-image generation tasks. Motivated by these findings, we conduct a controlled study to investigate compositional generalization in diffusion models using synthetic tasks. By systematically varying training data attributes, we measured models' capacities to generate out-of-distribution samples. Our results reveal three key insights: (i) compositional ability emerges according to the underlying data-generation structure; (ii) compositional-task performance shows sudden "emergence" due to multiplicative dependencies on constituent tasks, clarifying emergent behaviors in generative models; (iii) generating out-of-distribution samples from rarely encountered concept combinations requires significantly more optimization steps compared with generating familiar combinations. Our findings establish a data-centric framework for understanding emergent compositional capabilities in generative models.