ABCI 3.0開発加速利用 （2025年度）成果概要（公開用）

課題名： 継続的ベイズ推論の改善	実施時期：2025年10月 – 2026年3月 所属機関名：理化学研究所 代表者氏名：Khan Emtiyaz

成果概要：This project aims to apply Bayesian Learning Rule (Khan and Rue, JMLR, 2023) to the pre-training and mid-training of LLMs with billions of parameters. The goal is to achieve efficient continual learning even with large-scale models.

成果のポイント：

Conventional deep learning has shown great success, yet it makes the strong assumption that all training data is available before training starts. This often leads to a catastrophic forgetting of previously learned tasks when attempting to update trained models with new data. This project develops models that can continuously learn new information while retaining previously acquired knowledge. While there exist several previous studies on continual learning in deep learning, many of them only aim for empirical performance improvements by relying on heuristics. In contrast, this project leverages mathematically founded Bayesian principles based on the concept of adaptivity to rethink continual learning.
By using our recently proposed IVON optimizer (Shen et al., ICML, 2024), a deep learning algorithm based on the Bayesian Learning Rule (Khan and Rue, JMLR, 2023), we aim to develop Large Language Models (LLMs) that can continually learn and adapt. During this fiscal year, we developed the required software tools and conducted preliminary validation thereof. In particular, we conducted preliminary training experiments of OLMo2 (Team OLMo, COLM, 2025), which is a publicly available LLM originally developed by the Allen Institute for Artificial Intelligence (Ai2). Our experiments included pre-training of the one billion parameter version, as well as mid-training of the seven billion parameter version.

成果についてより詳細な情報を提供しているWebページ、発表論文などの情報：