2023年度共同利用研究報告書

2024年05月08日

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		整理番号	2023a013	
1.研究計画題目	大規模ランダムアクセス通信に対する深層学習と情報理論による性能最適化			
2.新規・継続	新規			
3.種別	女性研究者活躍支援研究			
4.種目	短期研究員			
5.開催方法	対面開催			
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7.研究実施期間	2023年09月04日(月曜日)～2023年09月08日(金曜日)			
	2024年03月25日(月曜日)～2024年03月29日(金曜日)			
8.キーワード	大規模ランダムアクセス通信, 深層学習, 情報理論			
9.参加者人数	6人			

10.本研究で得られた成果の概要

In the 6th generation mobile communication network, a large-scale random access communication systems are crucial for accommodating a massive number of communication devices on the same frequency band with high reliability, low latency, and scalability.
In these communication systems, the number of users is immense (virtually infinite), allowing for simultaneous transmission by multiple users, characteristic of massive machine-type communication.

Recently, researchers have focused on methods to model the estimation and decoding of communication channels and messages by processing extensive communication data through machine learning and deep learning techniques. However, it is generally impractical for the training data to cover all possible patterns since the range of communication channel states and active user patterns is infinite. Additionally, as the number of potential users grows, it is necessary to retrain the neural network. This limitation can result in performance degradation or inadequate scalability.

In this research, we give an information theoretic interpretation to trained deep neural network.
We first investigate the relationship of the learned features of neural network and characterises of signature matrix. Then we establish a framework for designing learning systems that separate feature learning and feature usages, where the learned features can be assembled to build different signature matrix models without retraining.

報告書は 2026 年 4 月までに公開予定