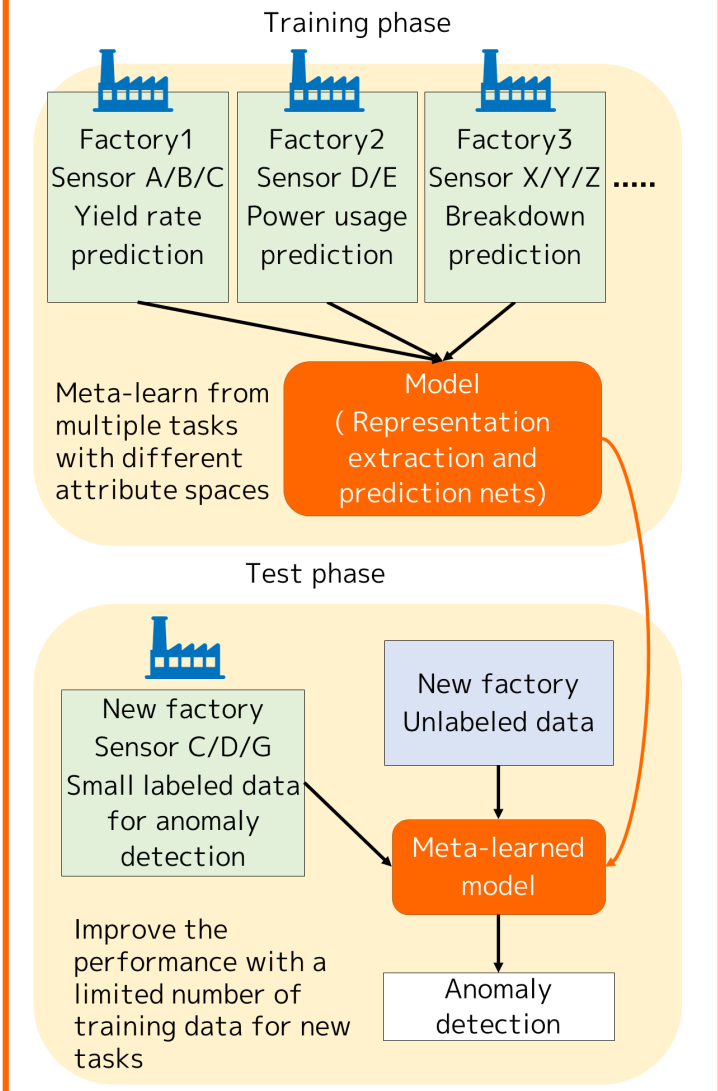
01 Meta-learning from tasks with heterogeneous attribute spaces

Learning how to learn from various datasets

Abstract

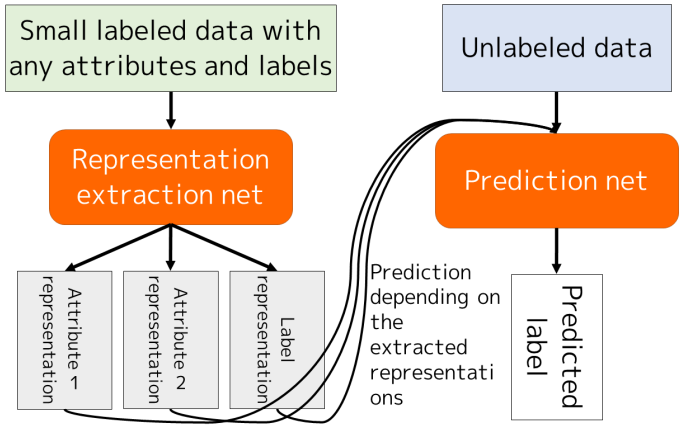
Many training data are required for deep learning. We propose a meta-learning method that can improve the performance with a limited number of training data in the target task by using data in different tasks. For example, the proposed method can be used for learning from data in different factories. Existing meta-learning methods assumes that all tasks have the same attribute space. The proposed method is the first method that can meta-learn from tasks with different attribute spaces. With the proposed method, we design permutation invariant neural networks that can handle data with different attributes and labels. Currently, we cannot apply machine learning methods when sufficient number of training data are unavailable. We want to expand field where machine learning methods are applicable by extending the proposed method.

Meta-learning form different factories



Proposed model

We design two neural networks that can handle different attributes and labels.



Evaluations

- Data：59 Datasets for regression in OpenML (Machine learning data sharing service) with 10-300 instances and 2-30 attributes

Test mean squared errors

Ours	Meta-learning1	Meta-learning2	Linear regression	Nonlinear regression
0.788	0.854	0.845	1.179	0.828

Meta-learning1: Gradient-based adaptation [ICML2017]
Meta-learning2: Neural network-based adaptation [ICML2018]
Linear regression: Ridge regression trained by test data
Nonlinear regression: Kernel ridge regression trained by test data

References

[1] T. Iwata, A. Kumagai, "Meta-learning from Tasks with Heterogeneous Attribute Spaces," in *Proc. Neural Information Processing Systems (NeurIPS)*, 2020.

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